ARMY CHEMICAL REVIEW

THE PROFESSIONAL BULLETIN OF THE CHEMICAL CORPS

Headquarters, Department of the Army

PB 3-05-1
January–June 2005

Protecting the Nation

Articles

Features

Chief of Chemical

Brigadier General Stanley H. Lillie

2004 is behind us, and the Chemical Corps is charging full speed ahead into a new year. Last year was a very busy and fruitful year for the Chemical Corps. First and foremost, the Corps continued to serve our Nation in the Global War on Terrorism and support our soldiers in the field. We have many fine chemical soldiers deployed around the world who are advising their commanders on the best way to protect their units from the threat of chemical, biological, radiological, and nuclear (CBRN) hazards and preserve the fighting force. These soldiers are doing the mission that they were trained for, and the reports that I have received from senior leaders indicate that our Chemical Corps soldiers are serving our Nation with distinction.

There were many significant accomplishments for the Chemical Corps in 2004. The chemical sections of the Directorate of Training and Doctrine (DOTD) and the Directorate of Combat Developments (DCD) were reassigned to the Chemical School. The Chemical School was also designated as the joint combat developer for CBRN defense. Our initial task is to conduct experimentation to support all services, as directed by the Joint Requirements Office (JRO). The Chemical School was also named the executive agent for management of the homeland security programs at the Maneuver Support Center (MANSCEN).

> *The Chemical Corps vision is where we need to go in the future, but we will never accomplish the task set before us without each one of you working with me to achieve it.*

The Chemical Corps became the proponent for the Technical Escort Course in 2004, although the course will continue to train in the facilities at Redstone Arsenal, Alabama. As the proponent, we will provide timely support to the new 20th Support Command, activated at Aberdeen Proving Ground, Maryland, in October 2004. The 20th Support Command, formerly called the Guardian Brigade, includes the 52d Ordnance Group (EOD), the 22d Chemical Battalion (Technical Escort), and the 110th Chemical Battalion (Technical Escort) (scheduled to activate in September 2005).

In 2004, the Chemical Corps activated two Joint Biological Point Detection System (JBPDS) multiple-component (multicompo) Biological Integrated Detection System (BIDS) companies. Multicompo units have platoons in the Active Army and the Army Reserve. The Corps also received approval to build the first 17 Stryker nuclear, biological, chemical reconnaissance vehicles (NBCRVs), which will be fielded to the Stryker brigade combat teams.

We refined and began sharing the vision for the Chemical Corps in 2004. Many of you have seen the vision statement (see *page 5*) on the Chemical School Web site or heard me talk about it on other occasions. The vision sets our azimuth for the future. We are developing a campaign plan that will guide our efforts to implement the vision. Your participation as we formulate the details of the vision is a critical element to its success.

The Chemical Corps vision is where we need to go in the future, but we will never accomplish the task set before us without each one of you working with me to achieve it. You are the Dragon Soldiers in the units, advising your commanders on CBRN issues. You are training soldiers at the unit level and taking care of the CBRN equipment. You are studying the field manuals and reading articles on CBRN topics to continue to develop your knowledge and expertise. You will enforce the standards and show the officers, noncommissioned officers, and soldiers in your units "what right looks like." Look in the mirror; you are the face of the Chemical Corps to your units. It is you that the commanders and units rely on for professional expertise!

(Continued on page 4)

The Role of the Chemical Corps in the Contemporary Operational Environment

Command Sergeant Major Patrick Z. Alston

In times of war, the Army has always maximized its focus on defeating other nations to achieve its strategic goals. Moreover, it is equally important to remember that the United States must consistently be prepared to counter regional or state-centered threats. Over the last decade, transnational threats (terrorist activity, international crime incidents, drug trafficking, incidents by culturally motivated hate groups) have also become a concern. These nontraditional threats have forced the Chemical Corps to improve staff integration and create better chemical, biological, radiological, and nuclear (CBRN) vulnerability analysis products.

Needless to say, these nontraditional influences have increased the homeland security risk. The US military currently has Field Manual (FM) 3-11.21, *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical Aspects of Consequence Management*, as a doctrinal guide for dealing with the increased risk of nuclear, biological, and chemical (NBC) incidents in the United States. According to this manual, *"U.S. forces may be required to support civil authorities in domestic or foreign situations/incidents due to the deliberate or unintentional use of NBC weapons or materials."*

> *To achieve greatness in this support role, the Corps must expand its interaction and training with first-responder personnel and other federal agencies...*

The support role of our Chemical Corps is cast as a partnership with the Department of Defense, which acts as the lead federal agency in the event of an NBC incident in the United States. To achieve greatness in this support role, the Corps must expand its interaction and training with first-responder personnel and other federal agencies—the effectiveness of this partnership relies heavily on shared annual training. This involvement would ensure that chemical units are ready to effectively and professionally provide the NBC reconnaissance and decontamination support required by the agencies. To remain relevant in this support role, chemical units must have the resources—time, money, and increased training opportunities with other agencies, including participation in contemporary operational environment (COE)-focused training.

The Chemical Corps must improve the cast of the support role by improving and maximizing training at all levels. *Train. Rehearse. Train. Rehearse.* Every training plan should be balanced regarding traditional and nontraditional threats. For chemical units to remain relevant in this supporting cast, they must first be armed with a vulnerability analysis that puts them on the battlefield in the right place, at the right time, to mitigate and alleviate the threat.

Force protection is the primary reason for the existence of the Chemical Corps as it relates to homeland defense (HLD). The mission of our Corps is to protect the force and the nation from the use of CBRN weapons. And needless to say, that focus has not changed. The keys to the continued success of the Corps in the HLD mission are accurate vulnerability analyses and a meticulous system of support operations. I believe that the Corps has strong ties to the HLD misson that cannot—and will not—be easily broken.

(Continued from page 2)

The Chemical Corps will have a busy 2005 as we build on the accomplishments of 2004. With your help, we will continue to implement the vision and work to support chemical soldiers in the field. We are working to inculcate the Warrior Ethos into all training at the Chemical School. Every soldier, noncommissioned officer, and officer going through one of our courses will know that they are soldiers first and foremost.

We will continue to focus on lieutenant accessions. The Chemical Corps requires more officers with hard science backgrounds to help apply 21st century science and technology to the modern battlefield. In the past, only about 20 percent of our lieutenants had hard science backgrounds. This increased to 41 percent in 2004. My goal is that 80 percent of our lieutenants have a background in biology, chemistry, mathematics, engineering, or similar disciplines. This is another area where you can help. Many of you maintain close ties with your alma maters. If you correspond with the ROTC department of your school or talk with any current ROTC cadets, please tell them about the opportunities available in the Chemical Corps. The number of Chemical Corps opportunities and positions in units with high-end capabilities is increasing. Many of the cadets with hard science backgrounds will accept the challenge and be grateful to you for letting them know about the exciting opportunities the Chemical Corps offers.

The Chemical School will continue to modernize in 2005 to meet our responsibilities for homeland defense and improve our training facilities. In the spring, Fort Leonard Wood will begin construction of a new CBRN responder training facility. This facility will provide more realistic training, including a simulation area for virtual emergency response training and an urban façade, cave complex, and other types of ranges. It will support Department of Defense emergency-responder training for CBRN installation protection, WMD civil support teams, and other first and emergency responders. This facility will improve our capability to train Dragon Soldiers across the full spectrum of operations, to include sensitive-site exploitation.

There is one additional thing that you can do to help implement the Chemical Corps vision in 2005—take care of your soldiers, your unit, and the Army. Share what you are learning with your fellow chemical soldiers to help them become better. Write an article for submission to *Army Chemical Review* (see *page 43*) or one of the other professional magazines. You are at the point of the spear, working through the challenges of deployments and overseas operations. Write about what you are learning and how you met the challenge. The process of composing an article will help solidify in your mind the things that you have learned and provide assistance to chemical soldiers who will take on the task in the future.

The Chemical Corps Regimental Association (CCRA) is sponsoring the 2005 Chemical Corps writing contest (see *page 6* for details). We chose four topics for you to select from. I challenge you to participate in this event. The CCRA is generously awarding $500 for the first-place article, $300 for second place, and $150 for third place.

Dragon Soldiers, I am proud of each and every one of you. You are doing a great job! Together, we are key assets in the Global War on Terrorism as we provide CBRN expertise to the commanders in the field. And when there is no CBRN threat, you are performing whatever tasks are required of you to ensure that your unit's mission is accomplished. Every day you prove that the Chemical Corps is an effective combat multiplier and is serving our Nation well. Keep up the great work. Finally, the Chemical School is here to serve you as you fight the fight; don't hesitate to call for information or support if you need it. We will do everything we can to give you the assistance you need to accomplish your mission. Together, we can make the Chemical Corps vision a reality!

Warrior Ethos

I will always place the mission first.
I will never accept defeat.
I will never quit.
I will never leave a fallen comrade.

THE CHEMICAL CORPS VISION

1. An Army superbly equipped, trained, and ready to fight and win, unhindered by threatened or actual CBRN hazards.

- Soldiers and combat systems capable of continuous operations at 100 percent effectiveness, while protected from CBRN hazards.
- Real-time, networked battlespace awareness of all CBRN hazards.

2. A Corps of professional soldiers, tactically and technically unsurpassed, imbued with the warrior ethos.

- Warriors who are—
  - Trained and educated in the CBRN sciences and technologies required for the 21st century.
  - Equally competent in or out of combat.
  - Equally competent in or out of a CBRN environment.
- A values-based university that is the keystone to initial and lifelong education for the professional Corps.
  - Staffed by the best quality and operationally experienced cadre.
  - Equipped with state-of-the-art facilities and instructional technologies.
  - Fully integrated with all the services.
  - Positioned on the edge of change.
- An army of soldiers and units that are confident and competent to operate in any CBRN environment, supported by a professional Corps of technically proficient warrior scientists.

3. A capability, both vital and relevant, for the combatant commander, the joint warfight, and the defense of the homeland.

- Units that are designed, tailored, trained, and ready for immediate employment across the full spectrum of joint operations, to include the homeland.
- Organizations and soldiers at all levels that are technically proficient in detection, identification, and response to the full range of CBRN hazards.
- Units designed and equipped to mask and protect the joint force through the selective manipulation of the electromagnetic spectrum.
- A forward-looking, joint-force advocate that is continuously developing solutions for emerging threats and missions.

2005 Writing Contest

Each year, the Chemical Corps Regimental Association sponsors a writing contest. The contest is open to military personnel in all branches and services, including allied nations, and civilians of any nationality. The purpose of the contest is to stimulate thinking and writing on issues of concern to the Chemical Corps.

The themes for the 2005 writing contest are—

- **Implementing Army transformation in units.** Identify how units are implementing change and transforming to the modular force.
- **Chemical units and staffs in nontraditional roles.** Identify actual or potential missions performed by chemical units or staffs in support of operations other than the traditional chemical missions.
- **Inculcating the Warrior Ethos in chemical soldiers.** Identify ways to inculcate soldiers with the Warrior Ethos during unit or institutional training.
- **Implementing the vision of the Chemical Corps.** Reveal thoughts on implementing the vision in general or a specific component of the vision.

Each article should be submitted as a double-spaced paper manuscript accompanied by a 3 1/2-inch or compact disk containing the file in Microsoft Word format. The article should be between 500 and 2,500 words in length and contain the appropriate footnotes, bibliography, and graphic or photo support. Hard copy photos are preferred; however, if digital photos are submitted, they should be saved at a dpi/ppi of 200 or more and at 100 percent of the actual size. In addition to the manuscript, submissions should include a cover sheet with the author's name, title, organization, complete mailing address, and a short biography.

To ensure anonymity in the selection process, the author's name should not appear in the manuscript itself. The selection panel will rank submissions on the 100-point scale, with up to 40 points assigned for writing clarity, 30 points for relevance to chemical soldiers, 20 points for general accuracy, and 10 points for originality.

The authors of the winning articles will be awarded the following:

First place, $500

Second place, $300

Third place, $150

The deadline for submissions for the 2005 writing contest is 1 July 2005. Please forward your submissions to—

Mr. David C. Chuber
Chemical School Historian
401 MANSCEN Loop, Suite 1041
Fort Leonard Wood, Missouri 65473-8926

For additional information, contact Mr. Chuber at—
Phone number: DSN 676-7339; Commercial (573) 596-0131, extension 37339
E-mail: david.chuber@us.army.mil

Chemical Corps Efforts to Support the National Guard in its Role as Responders for CBRNE Missions

By Lieutenant Colonel William Christmas (Retired) and Mr. Mike Todd

"The National Guard is organized, trained, and equipped by the Department of Defense, and can operate in all traditional DOD missions within the spectrum of Title 10, 32, or state active duty forces. Additionally, the National Guard in state status possesses many of the attributes required of an effective Joint Force, yet remains responsive to state sovereign authorities free of the limitations that constrain federal forces."

—Department of Defense Homeland Security Joint Operating Concept, February 2004

Volumes of material are devoted to the role that the Department of Defense (DOD) plays in response to domestic terrorist attacks involving chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE). Numerous "think tanks" across the United States are publishing articles restating the perceived role of the DOD in domestic terrorist events, and strategic guidance documents and directives have been issued defining the mission. But what does the Chemical Corps support effort to domestic consequence management, as it applies to the National Guard (NG), look like for the near term? How will the Chemical Corps focus its capabilities to prepare NG units to respond to homeland security (HLS) missions?

An understanding of the organization and service structure of the NG is necessary when discussing domestic CBRNE support missions. Currently, the Army National Guard (ARNG)—367,000 strong—makes up more than one-half of the total Army ground combat force and one-third of its support force. Air National Guard (ANG) units have a total strength of 109,000. The ARNG has units in 2,700 communities in all 50 states, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands. The ANG has 88 flying units at more than 170 installations nationwide. Since each state and territory has an ANG unit, rapid deployment is enhanced. This "constitutionally unique" mission and the placement of forces are great advantages, especially in support of the HLS mission (see *Figure 1, page 8*).

The role of the NG as the first line of military capability under the control of the state governors is an important factor in its viability to support homeland defense (HLD). Doctrine and training are obvious areas for the Chemical Corps to expand its contribution to the HLS mission. The development of the weapons of mass destruction–civil support team (WMD-CST) is just the first manifestation in the evolution of a full-spectrum, response and support system fulfilling a defined need. WMD-CST state support requires personnel qualification and certification not traditionally trained by the Chemical Corps. But the Corps plans to absorb these capabilities, leverage its traditional expertise, and integrate with other services and Army branches to become the DOD experts. The NG is committed to a joint CBRNE ARNG/ANG force that is—

- Able to collaborate with other federal agencies.
- Prepared for present and future missions.
- Missioned across the spectrum of contingencies (from domestic to warfighting operations).
- Structured and resourced to accomplish its missions.
- Capable and accessible when mobilized in State Active Duty status, under Title 32, United States Code (USC) and/or Title 10 USC.
- Staffed with trained citizen soldiers and airmen committed to serving their local communities, state, and Nation.

In essence, the NG wants a force that is fully integrated into CBRNE operations today and tomorrow, whether it be to support civil authorities (as part of the domestic Global War on Terrorism [GWOT] or in response to a natural disaster or a CBRNE incident) or to support a combatant commander (in response to United States Northern Command [NORTHCOM] Joint Force Headquarters HLS [JFHQ-HLS], Joint Task Force Civil Support [JTF-CS], and/or Joint Task Force Six [JTF-6]). Also, it is important to understand that most NG units are mobilized for a CBRNE, HLS, or HLD incident in State Active Duty status first (with the exception being the WMD-CSTs that respond in 32 USC status). However, when an incident becomes a federal incident, the status changes from State Active Duty status to either 32 USC or 10 USC status. *Figure 2* portrays the full spectrum of NG operations, including the response overlap in State Active Duty 32 USC and/or 10 USC status.

Figure 1. Guard unit locations (CONUS, Alaska, Hawaii, Puerto Rico, and Virgin Islands)

Strategic Concerns

There are three strategic concerns that could impact negatively on the capability of the NG to respond to CBRNE incidents:

- How long the GWOT will last. While the official position of the US government is that the GWOT is far from over, there is not a quantifiable assumption—general or specific—on how long this conflict will last.
- How the GWOT is viewed in relation to regional conflicts. There is currently no established relationship.
- How the military force structure and operational plans (historically designed to perform combat missions, obtain battle victories, and win military campaigns) will transition to a holistic mission of successfully concluding conflicts and building peace operations.

The first two strategic concerns are very important. The closest thing that we have to a quantifiable assumption is that the GWOT could last for decades. While some might argue that this establishes a general assumption, the position is vague and lacks a minimum and maximum time range. And there is no attempt to relate the GWOT to the periodic eruption of regional conflicts. The lack of a quantifiable time range, coupled with the lack of a relationship with regional conflicts, could have a negative impact on the research and development (R&D) of CBRNE equipment. Military R&D efforts have historically focused on the equipment requirements that are needed to support traditional combat missions (airplanes, tanks, artillery, trucks), but the GWOT is different and the stakes are higher. There is a good chance that CBRNE R&D equipment requirements may be relegated to a lower priority by military planners. The following approach is the preferred assumption; however, *Figure 3* portrays a more realistic way of viewing the current GWOT and its relationship with regional conflicts:

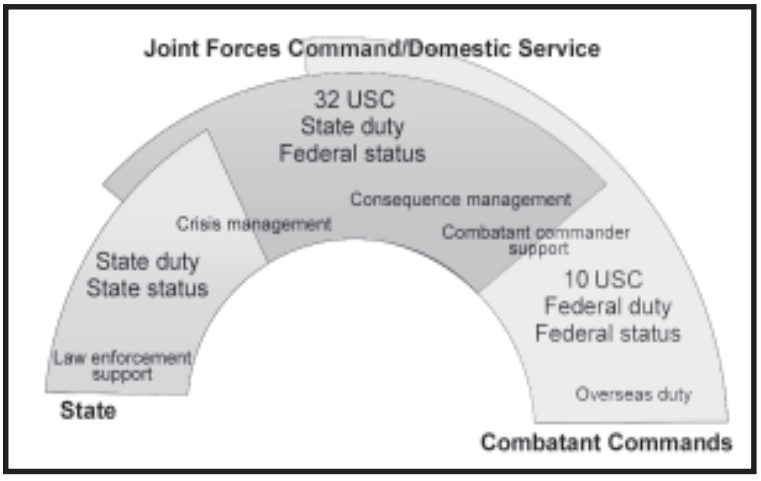

Figure 2. NG spectrum of operations

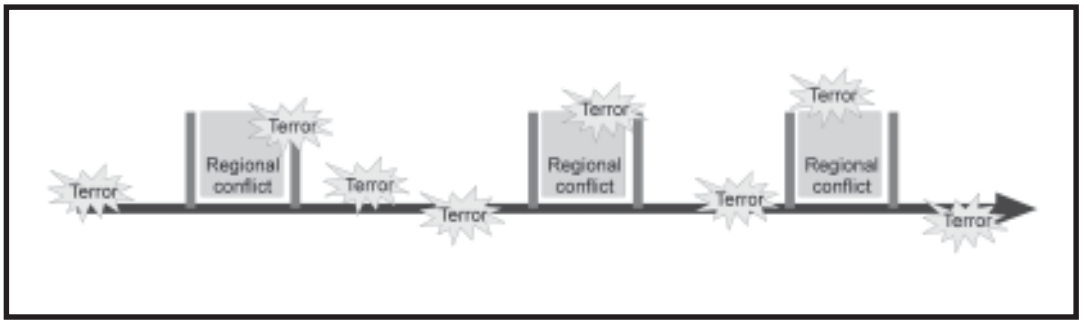

Figure 3. The GWOT and its relationship with regional conflicts

- The GWOT could last 20 to 100 years (or longer) and include periodic regional conflicts.
- There will be another significant terrorist incident in this country, most likely involving a CBRNE attack.
- NG units will play a prominent role in response to major HLS, HLD, and/or civil support incidents.

Another strategic concern has to do with how the military views regional conflicts. Most conflicts are planned and viewed as traditional combat operations. The Army, like the other services, uses this same approach. And yet it is the Army that must always assume the lead for stability operations and initial nation-building activities that directly follow successful combat campaigns. The shortfall in the Total Army Analysis (TAA) process, when focusing on combat operations, became readily apparent when the Army did not have trained chemical units in its force structure ready to hunt for WMD or deal with toxic industrial chemicals (TIC) or toxic industrial material (TIM) following combat operations in Operation Desert Storm and during recent operations against the terrorist insurgency in Iraq. While the Army responded to the challenge, it is apparent that regional conflicts are very different from combat operations. When viewing regional conflicts holistically, the following assumptions should be incorporated:

- Consideration for the various phases of regional conflicts—mobilization and deployment operations, combat operations (which may not exist in some small-scale contingency [SSC] operations), stability operations, nation-building activities, and redeployment and demobilization plans.
- Military support for all phases.
- A requirement for a minimum unit deployment time of one year.
- Unit rotations for extended conflicts (longer than 18 months).
- The prominent role of NG units, to include derivative unit identification code (UIC) functions.
- CBRNE equipment and the associated individual and collective skills needed and used for HLS, HLD, and/or civil support missions (required and necessary during stability operations and nation-building activities).

Figure 4 portrays a holistic and more realistic way of viewing regional conflicts and the associated phases of operations.

Capturing New and Emerging Technologies

The NG believes it should have the newest and best CBRNE equipment available to fight the GWOT. And this is not an issue of disagreement; however, the

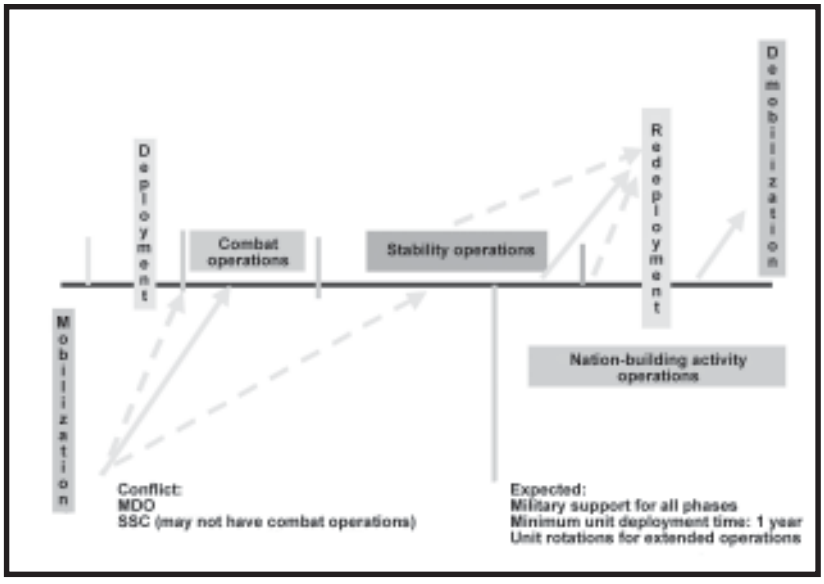

Figure 4. Conflict phase line

perceived inability of the Army to provide rapid fielding of leading edge CBRNE equipment has caused some friction between the Army and the NG. The Chemical Corps has made considerable strides in identifying capabilities through doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) analyses and bringing the acquisition process of HLS support equipment under the Joint Capabilities Integration and Development System (JCIDS). The US Army Chemical School must plan for sufficient resources to continue the progress gained thus far. To better understand what technologies might be needed for future planning, see *Figure 5*, which shows where the NG believes its CBRNE initiatives fit into the national response plan to WMD, TIC, TIM, and other terrorist incidents.

Much of the NG CBRNE technologies and equipment for this effort was obtained through commercial off-the-shelf (COTS) purchases, which often were not documented as required and/or authorized. This acquisition methodology is very similar to the way Special Forces units acquired materiel before being consolidated under a single command. The impact of not capturing new or emerging technical solutions resulted in the lack of—

- Standardization in COTS CBRNE equipment (performance abilities, maintenance man-hours, replacement parts, unit cost) purchased to satisfy the requirements of the different services.
- Timely (and, in some cases, no) equipment documentation, which further resulted in problems with—

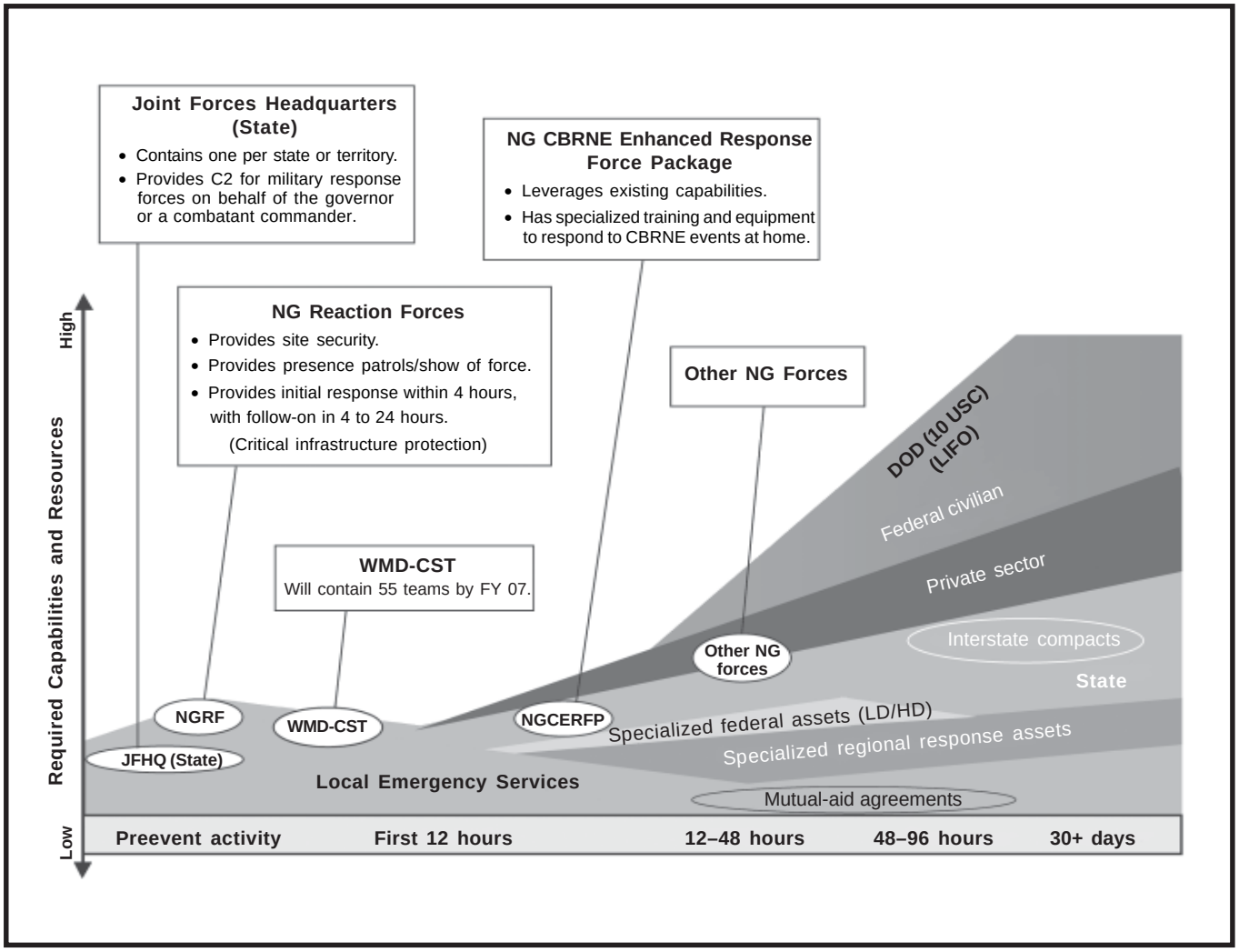

Figure 5. NG initiatives in the National Response Plan

- Programming sustainment dollars and life cycle replacement costs.
- Planning training requirements and training courses to teach individual and collective skills.
- Programming training and execution dollars.
- Obtaining full visibility (to DOD planners and combatant commanders and their staffs) of the CBRNE assets and capabilities currently available.
- Determining the reliability of purchased COTS items that were not performance-tested by DOD.

The chief of the National Guard Bureau (NGB) has stated that he wants to make NG assets designed for civil support missions available for worldwide deployment.

Because the NG is at the forefront in domestic CBRNE response missions and its assets are subsequently available to combatant commanders, there is an urgency to speed up the requirements determination and documentation processes. By being proactive, the Chemical Corps is avoiding a repeat of the mistakes highlighted in the Inspector General's report on the management of the WMD-CST program by the Consequence Management Program Integration Office (CoMPIO).[1] The report highlighted that the CoMPIO "failed to provide adequate guidance, training, and equipment for the 10 CSTs." Additionally, the "equipment acquisition process CoMPIO employed to purchase equipment for the WMD-CSTs unnecessarily circumvented the normal DOD acquisition channels." The Chemical Corps is mindful of the unique capabilities the NG needs to support the HLS mission and is actively institutionalizing the HLS requirements and acquisition processes.

Bridging the Gap

The chief of the National Guard Bureau (NGB) has stated that he wants to make NG assets designed for civil support missions available for worldwide deployment. This will require a change in the federal statutory law to deploy the WMD-CSTs. In a March 2004 memorandum to the Chairman of the Joint Chiefs of Staff, the NORTHCOM commander stated his support for the formation of NG CBRNE-enhanced response force packages (NGCERFP). The NGCERFP will be organized from current NG units (matrix organizations) that could easily be mobilized by derivative UICs for CBRNE missions or could mobilize as part of organic units. However, the chief of the NGB has also stated that he wants to support joint expeditionary capabilities worldwide, while still ensuring that state governors and adjutants general always have 50 percent of their NG assets available for domestic missions. *Figure 6, page 12*, represents the vision of the Chief of the NGB and implies the following requirements to be considered:

- NG personnel and equipment missioned for HLS and HLD are moving toward an outside continental United States (OCONUS) deployment to support the GWOT.
- Battlefield vehicle platforms must be developed for the Unified Command Suite (Communications) and Analytical Laboratory Systems and pre-positioned with other equipment to support OCONUS deployments.
- CST and NGCERFP equipment must be retained within the states, territories, the District of Columbia, Puerto Rico, and Guam to support domestic CBRNE missions.
- Active Duty for Special Work (ADSW) and mobilization day (M-day) personnel (soldiers and airmen) must be trained to backfill guardsmen who have been mobilized or are getting ready for deployment missions.

The CBRNE forces that must be addressed are the WMD-CST unit and the NGCERFP (a matrix organization made up of assets from various units). The principal capabilities are shown in *Figure 7, page 12*; the top two capabilities are of specific interest to the Chemical Corps.

The Chemical School is the executive agent for the HLS Office (Manuever Support Center). As the executive agent, the Chemical Corps will develop a close working relationship with the NGB, the state adjutants general, the NORTHCOM combatant commander, other commands, US Army Training and Doctrine Command

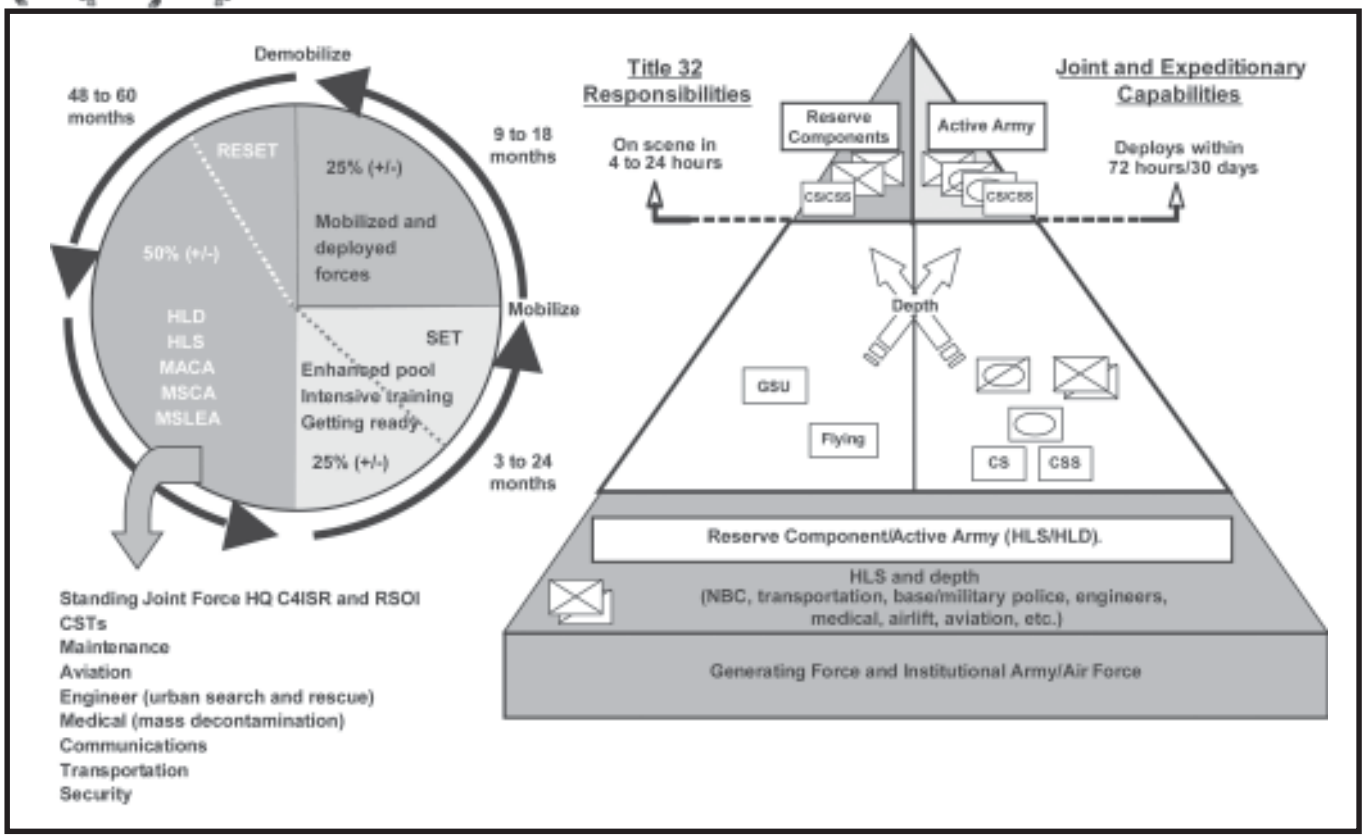

Figure 6. Full-spectrum force

schools and centers, fellow services, and other federal agencies to ensure the force integration of CBRNE mission requirements for HLS and the GWOT.

Endnote

[1] "Management of National Guard Weapons of Mass Destruction–Civil Support Teams," Office of the Inspector General, Department of Defense, Report No. D-2001-043, 31 January 2001.

Lieutenant Colonel Christmas previously served as the Chemical School NG Deputy Assistant Commandant.

Mr. Todd works for Advancia Corporation, where he provides support to the Homeland Security Office at Fort Leonard Wood, Missouri. He is a former Marine Corps officer.

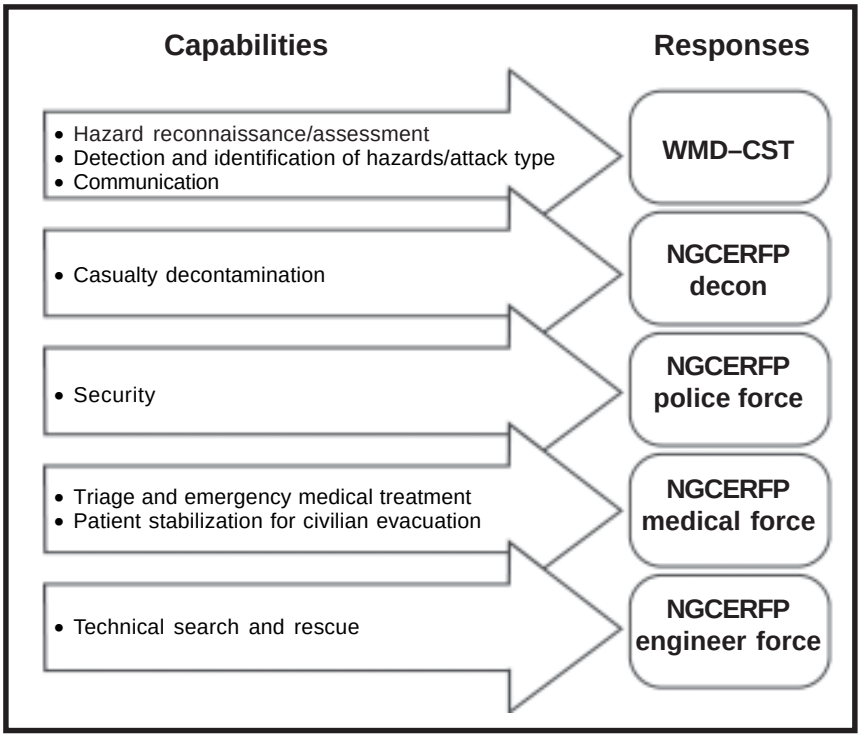

Figure 7. Principal capabilities of the NGCERFP

Chemical Corps Reserve Components:

A Complementary, Not Supplementary, Force

By Lieutenant Colonel William Christmas (Retired) and Mr. Mike Todd

"The U.S. government has no higher purpose than to ensure the security of our people and preserve our democratic way of life. Terrorism directly threatens the foundations of our Nation—our people, our democratic way of life, and our economic prosperity."

—The National Strategy for Homeland Security, July 2002

New threat realities are transforming the Chemical Corps, and the Corps will play a major role in instituting the Nation's Homeland Security (HLS) Program. In today's world, the term *Global War on Terrorism (GWOT)* is almost cliché. And this trend will likely continue for decades. With the technology, training, and professional soldiers in the Chemical Corps, what other Department of Defense (DOD) agency is better-suited to plan and execute the Nation's strategy against a weapons of mass destruction (WMD) attack? Guidance from the Chief of the Chemical Corps tells us that the Corps, with all of its personnel expertise, will take the lead in WMD force protection and consequence management programs and chemical, biological, radiological, and nuclear (CBRN) military support to civil authorities. The most difficult HLS challenge is not combating specific forms of WMD or the hostile use of powerful technologies, but rather how the Corps will allocate personnel and materiel resources; define its support relationships to federal, state, and local agencies; and structure training and leader development initiatives to meet the Army and DOD domestic support roles in the defense of our families, friends, and neighbors. The Chemical Corps will likely have the dual mission of supporting contingency and HLS operations; the challenge will be to accomplish these operations without becoming a "two-track Corps." A main objective is to develop a dedicated CBRN force with the mission expertise and capabilities to support civil authorities—a force that includes structure and provides large-scale decontamination capability that includes fixed sites, terrain, personnel, and a professionally trained reserve component (RC) force. To remain a leader in CBRN response operations, domestically and abroad, the Corps must continue to integrate doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) mission capability strategies and provide soldiers and personnel in other services (active and reserve) the ability to respond to homeland defense (HLD) missions and support our combatant commanders in traditional, force projection combat operations.

Personnel perform an equipment check.

Chemical Corps Uniqueness

The Chemical Corps must take the lead in the HLD mission by supporting RC forces with its unique soldier capabilities and depth of specialized knowledge. The talent and experience that chemical soldiers and officers have in the science and behavior of CBRN threats can be mobilized to counter any contingency and operate in an operational environment dominated by science and technology. The personnel in today's Chemical Corps are

gaining the skills and knowledge to advise any leader—civilian incident commander or combat commander—in tactical operations. As combat developers, the Chemical Corps is the force behind CBRN HLS materiel requirements determination. Additionally, the Corps has been key in establishing research and development and acquisition priorities, resulting in the assignment of developmental line item numbers (LINs), basis of issue plans (BOIPs), and incremental change packages (ICPs) assigned to groups of BOIPs.

The Chemical Corps is the driving effort behind the timely force integration of the United States Northern Command (NORTHCOM); the Chemical, Biological, Radiological, Nuclear, and High-Explosive (CBRNE) Command; United States Army Reserve (USAR) chemical units; and other Title 10, United States Code (USC) assets into the National Guard (NG) Title 32, USC response and support to state civil authorities. This integration will result in shorter federal DOD response times for domestic events. Additionally, this integration merges NG CBRNE initiatives for HLS into the overall DOD activities to fight the GWOT.

The United States Army Chemical School (USACMLS) and the Chemical Corps are the premier organizations for individual DOD CBRN training and have unique facilities and technical reach-back capability not found anywhere else. The proximity of the Chemical Corps to the Military Police Corps and the Engineer Corps at Fort Leonard Wood, Missouri, provides an unrivaled ability to collaborate on mutual challenges in HLS mission areas. With the development and building of a CBRN/WMD responder training facility, the Chemical Corps will provide vital skills in CBRN response missions. The USACMLS is currently developing numerous training courses for the NG WMD–civil support teams, installation emergency responders, and future Active Army and RC organizations.

Personnel check for hazardous material.

Personnel conduct a suspect-package check.

Homeland Security Joint Operating Concept

The DOD HLS Joint Operating Concept, dated February 2004, emphasizes the criticality of preventing attacks on the homeland and lists options for mitigating the effects should these attacks occur. The concept document also highlights the need to integrate and synchronize military operations within the national security strategy construct and in coordination with other government agencies and allies of the United States. HLD missions supported by the USACMLS will involve the expertise and technology required for warfighting missions but will be applied to missions in the domestic battlespace.

Future Capabilities

There are 13 desired future capabilities identified in the HLD Joint Operating Concept that define what DOD must be able to do in order to detect, deter, prevent and, if necessary, defeat attacks on the homeland or mitigate the effects of attacks that do occur. The Chemical Corps has roles established in several of these capabilities that are specifically within the Corps' mission for domestic operations:

- Collaborate with other federal agencies.
- Conduct or facilitate vulnerability assessments.
- Encourage risk management strategies to protect against and mitigate the effects of attacks against the defense industrial base.

The protection of the defense industrial base is a DOD responsibility that is specifically stated in the National Security Strategy of the United States of America. The measure of success for the Chemical Corps in this strategic concept will be its ability to quickly translate

specific expertise and knowledge to other federal agencies with the necessary detail and understanding so that critical and timely decisions are made to protect against or mitigate the effects of attacks. Collaboration with other Army branches (medical, engineer, military police, signal) and our sister services is key to developing protective tactics, techniques, procedures, and technologies for the protection of the defense industrial base. To provide a path, the Corps must leverage the development and insights gained from force protection and installation protection programs and prepare doctrine to aid in the mitigation of the effects of simultaneous CBRNE events. And this is within the traditional expertise of the Chemical Corps—its "meat and potatoes." The new threats facing the homeland will likely involve simultaneous attacks. Our RC forces, from their dispersed locations, will be deployed to provide agent detection and assessment, quarantine, evacuation, force protection, decontamination, and medical surge operations. The RC will—

- Possess the proper equipment to conduct prolonged missions in austere contaminated environments.
- Conduct HLD and civil support (CS) operations and emergency preparedness (EP) planning activities, while operating as the lead federal agency (LFA) or providing support to an LFA, or during transfer-of-responsibility operations.
- Conduct HLD and CS operations and EP planning activities when responsibilities overlap or during the absence of the formal designation of an LFA.
- Support a prompt and coordinated federal response for HLD and CS missions and EP planning activities, and facilitate and streamline a rapid decision-making process on support relationships among agencies.

The Chemical Corps will play a significant role in preparing for HLD, CS, and EP missions to achieve these future capabilities. Again, the establishment of a CBRN/WMD responder training facility will include innovations to train and prepare our leaders to assume the LFA function (if designated by the President) or a support role in domestic operations.

As outlined in the HLS Joint Operating Concept, in order to be able to meet the HLD, CS, and EP responsibilities by 2015, the Chemical Corps must be—

- Fully integrated.
- Expeditionary.
- Networked.
- Decentralized.
- Adaptable.
- Decision-superior.
- Effective.

Chemical Corps Support to the Reserve Component

The CBRN defense capabilities the Chemical Corps provides to the Army are essential to warfighters to help federal, state, and local agencies defend the homeland. The Corps must continue to integrate the unique requirements and the traditional RC missions into its overall HLD mission. Much can be learned from these missions, which have often led the way in developing initiatives to combat and respond to acts of terrorism in the domestic battlespace.

The Army's support roles in the domestic CBRN defense mission have been derived from the foundations of the Fiscal Year 1994 National Defense Authorization Act, the Observations on the Nunn-Lugar-Domenici Domestic Preparedness Program report on combating terrorism, the Defense Against Weapons of Mass Destruction Act of 1996, executive orders, presidential decision directives, and Secretary of Defense memorandums establishing the proponency for domestic CBRNE responses. Given this history, it is clear that the CBRN proponency issue was initially assigned with a lack of understanding of the role and mission support to be provided or as a compromise to competing interests among DOD agencies. The tasks and functions performed by RC personnel are clearly within the domain of the Chemical Corps.

The Chemical Corps has outlined its support of the transformation goals of the joint and Army strategic visions. To accomplish these goals, the Corps may find it necessary to obtain the proponency for all CBRN elements operating within this domain. The consolidation of CBRN DOTMLPF functions within the Corps will focus on materiel and leadership development and produce an economy of effort across joint service programs.

Lieutenant Colonel Christmas previously served as the Chemical School NG Deputy Assistant Commandant.

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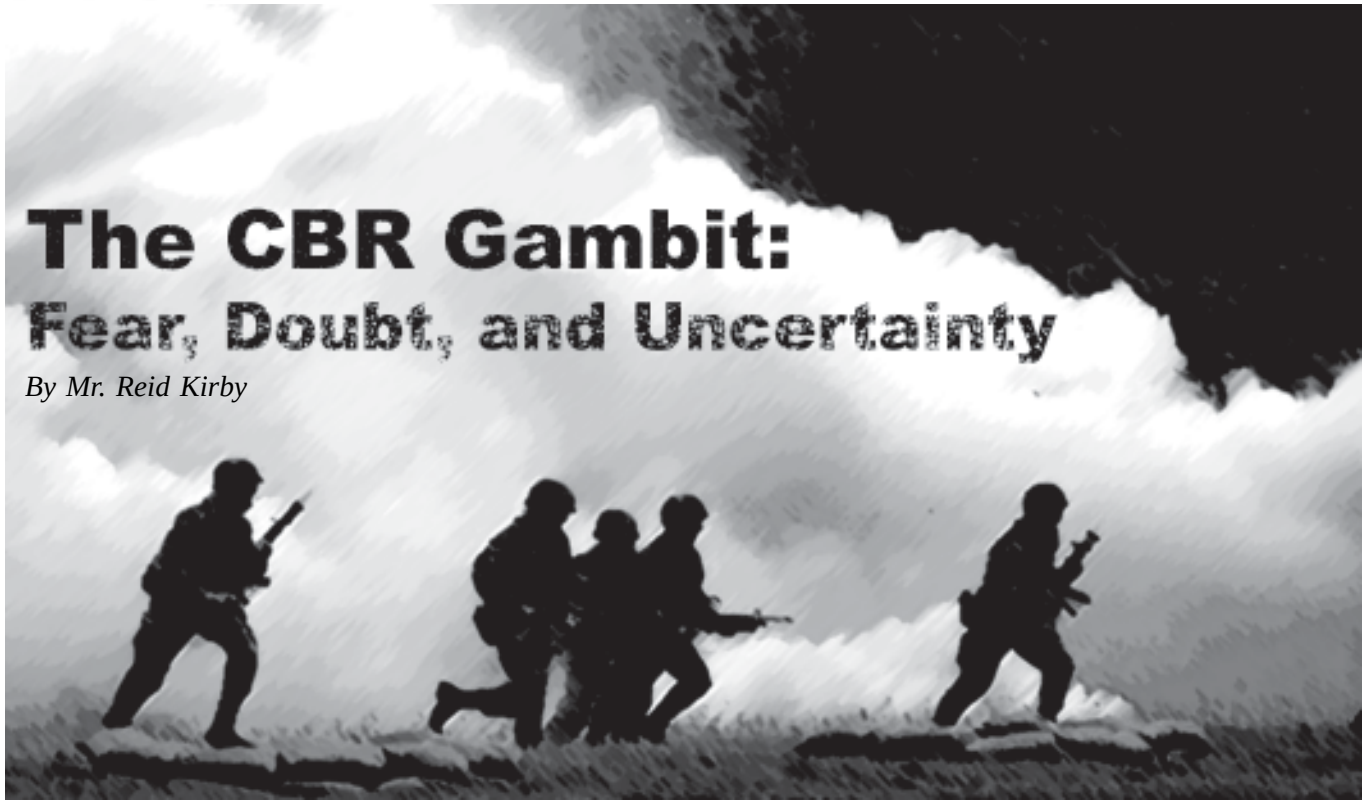

The CBR Gambit:
Fear, Doubt, and Uncertainty

By Mr. Reid Kirby

In chess, the gambit is a tactic that breaks from traditional wisdom to mislead an opponent into making a fatal mistake. In traditional military terms, it is often thought of as feint, but gambit also applies to a wider use in warfare. Chemical, biological, and radiological (CBR) warfare is used primarily to neutralize a force through its casualty effect. It can also deny a force utility to terrain, facilities, and equipment through its persistence. And there is also a third use in which CBR warfare disrupts operations—by harassing and prompting a force into a disproportionate protective posture or action.

Today, we are all familiar with one form of the CBR gambit—the anthrax hoax. These provocations precipitate a costly disruption of the day-to-day lives of victims (usually chosen at random). Fortunately, since the incidents lack coordination between parties, such hoaxes can be discounted as mere criminal mischief. However, throughout the history of CBR, the gambit had a more practical concept. This article explores several historical scenarios and the theoretical nature of the CBR gambit so that it may be recognized and its intent negated.

World War I

At the battle of Loos, the British placed smoke candles between chlorine cylinder emplacements and released smoke to fill the time gaps between gas waves. The 35- to 40-minute continuous smoke wave from the British trenches was a psychological tactic intended to give the Germans the impression that a large attack had occurred. Even though the black-green smoke was easily identified by the Germans as not being gas, anxiety was apparent, as was confusion to the extent of the attack.[1]

One of the most deliberate gambits during World War I was the use of "camouflage gas." Amos Fries noted that such a tactic was intended to mask the presence of a casualty agent, preventing identification or simulating a presence when none was used.[2] Though Fries notes that the use of camouflage gas was rarely successful in projector attacks, Robert MacMullen, First Gas Regiment, commented on its use as "skunk gas" in defeating machine gun positions for the infantry.[3] In this role, a 4-inch Stokes mortar fired a round of the foul-smelling formyl compound. While German machine guns were temporarily silenced as soldiers donned their masks, the infantry moved in for the kill. The Germans also understood the CBR gambit. It was common practice to follow each artillery barrage with a few chemical rounds in an attempt to create disruption. Additionally, the munition expenditures commonly used by Germany have often been noted as too low for any pronounced casualty effect, with the intent seemingly bent on disruption.

World War II

During the September 1939 German invasion of Poland, German engineers encountered entanglements at the bridges over the Wisloka River near Jaslo in Galicia. When they attempted to remove the barricade, explosions sprayed liquid from several cans. Fourteen men immediately succumbed to poisoning, and several died in the days following the incident. Except for the casualties, the experience went almost unnoticed. It was later discovered that the cans were Polish chemical defense devices filled with a standard mixture containing a fair proportion of mustard gas. Lieutenant General Herman Ochsner, the German Chief of Chemical, discerned the action as a desperate attempt by local forces to disrupt the German advance.[4]

The Cold War

The 1950 Stevenson Report, which evaluated the use of CBR, noted that the silent and persistent nature of radiological warfare meant that people would have to reasonably wonder if they were subjected to hidden radiological hazards anytime an enemy plane passed over an area. It would therefore be prudent that such areas would have to be surveyed before use. It was also recognized that radiological warfare as a form of harassment was more likely than incidents resulting in mass casualties.[5] At the time, similar sentiments were expressed regarding biological warfare—would the psychological impact outweigh the casualty effect?

Disruption and Harassment

As is the role of the gambit in a game of chess, the CBR gambit is an attempt to prompt a foe to expend his resources when not needed, thus creating disruption and degraded performance throughout the enemy force. The user of the CBR gambit exploits the fear, doubt, and uncertainty of his opponent by provoking a protective response. After World War I, it was estimated that the mere act of having to don a protective mask reduced a soldier's fighting capability by as much as 25 percent. In some field conditions, having to assume mission-oriented protective posture 4 (MOPP4) can reduce a soldier's capability without actual exposure to CBR.

Relation to Deception

The CBR gambit has similarities to the various types of Soviet deception. Soviet deception tactics, known as *maskirovka*, are a collection of improvisational techniques, such as soldiers carrying flashlights to look like truck movement or placing camp stoves under metal plates to look like tank infrared signatures. In reality, these techniques exploit an enemy's intelligence cycle, creating uncertainty during the time lag between the detection, interpretation, and reaction stages.[6] Maskirovka requires strategic, operational, and tactical synergy to be believable and influence enemy decision making. Likewise, the CBR gambit falls apart when it lacks strategic, operational, and tactical continuity.

Like maskirovka, the successful use of the CBR gambit depends on a force's knowledge of the enemy's detection assets and response doctrine. Through World War II, the leading agent detection method was a soldier's sense of smell, so a simulant for a CBR gambit needed only to smell like the real thing (see *Figure 1*). Today, a gambit with a simulant of a V agent is only useful if it can be detected by enzyme tickets, ion mobilization, or electrochemical reaction.

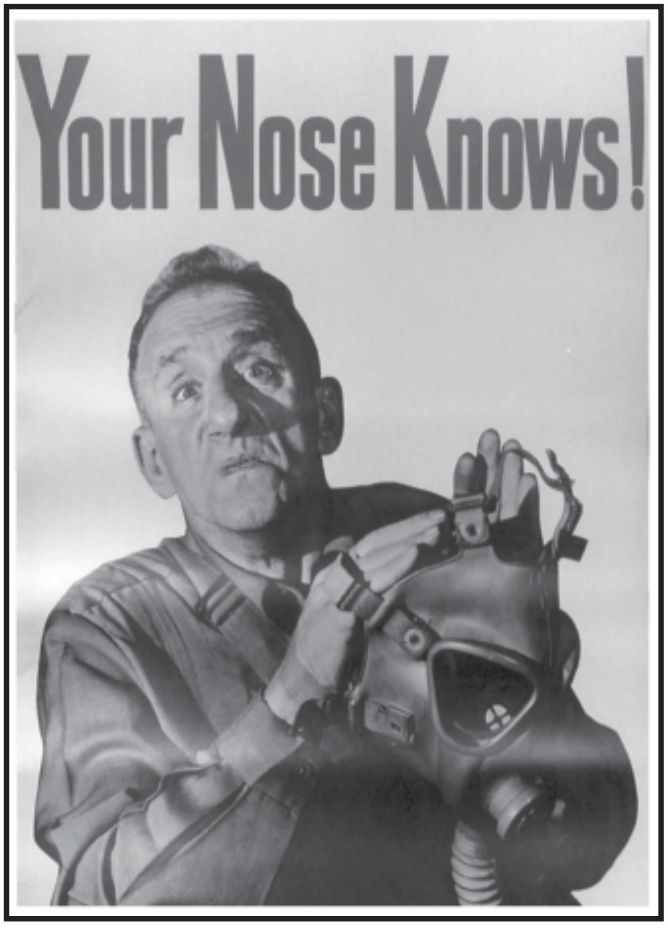

Figure 1. Through World War II, soldiers relied on their sense of smell to detect agents.

Understanding Uncertainty

Assume that you have a bag with two coins in it. One coin represents an actual CBR attack, with heads being just detection and tails being detection with casualties. The other coin has two heads, with both sides representing detection. How many times would you have to toss the second coin before realizing that the coin had two heads?

In 1948, Claude Shannon developed the Information Theory from his work with mathematical probabilities and statistics.[7] In his pivotal work, Shannon devised a theorem to quantify uncertainty by weighing the average of probabilities. By quantifying the uncertainty of a random variable, it is possible to indicate the average number of yes or no questions that must be asked to specify the value of that variable. It should be noted that the financial industry has a slightly different concept of uncertainty, seeing investments as having both risk (measurable probable outcomes) and uncertainty (unexpected change).

For example, assume that a military commander can expect—based on experience, field trials, historic study, and knowledge of force capabilities and terrain—his forces to move at an average rate of 20 kilometers per hour. The expected probability range would be 15 to 30 kilometers per hour. But when CBR is introduced, the premise for the expected rate of movement changes. This creates a new range of expectation. This event is comparable to the financial industry's concept of uncertainty. At first, without experience, the commander may make the assumption that the average rate of advance will be 10 kilometers per hour, with a range of 0 to 30. There is insufficient information to be more certain. As he becomes familiar with the CBR environment, the degree of uncertainty changes and he becomes confident that his forces will advance at an average rate of 15 kilometers per hour, with a range of 10 to 25. Uncertainty is dynamic and changes as information evolves (see *Figure 2*).

Another aspect of uncertainty is related to the distance between a person and the source of information. For example, when soldiers use a particular detection asset to detect the presence of a nerve agent, they are fairly certain that a positive test indicates the presence of the agent. As users of the technology, they believe what they are taught with little doubt. However, people familiar with the technology, design, and testing of the detection asset realize that there can be false positives and defective units, so their level of uncertainty is appreciably higher. On the opposite side of the spectrum are those who are not trained to detect nerve agents or are not familiar with the agent's effects. They too have a high degree of uncertainty that nerve agent was detected—they simply don't have enough understanding to believe the results one way or another. The certainty of soldiers trained on the detection asset is a phenomenon known as the "certainty trough" (see *Figure 3*).[8]

Risk Perception

How safe is safe? The CBR gambit also exploits risk perception. During the late 1970s, the Warsaw Pact addressed CBR exposure criteria based on an expected two-week survival time for soldiers in combat. The belief was that soldiers would not live longer than two weeks in modern combat, so the economic approach to protection was to secure full capability for up to two weeks. In theory, this meant that the Warsaw Pact forces could easily maneuver through areas that the North Atlantic Treaty Organization (NATO) forces would hastily evacuate. The difference in risk perception provided an edge to Warsaw Pact forces…for at least two weeks.[9]

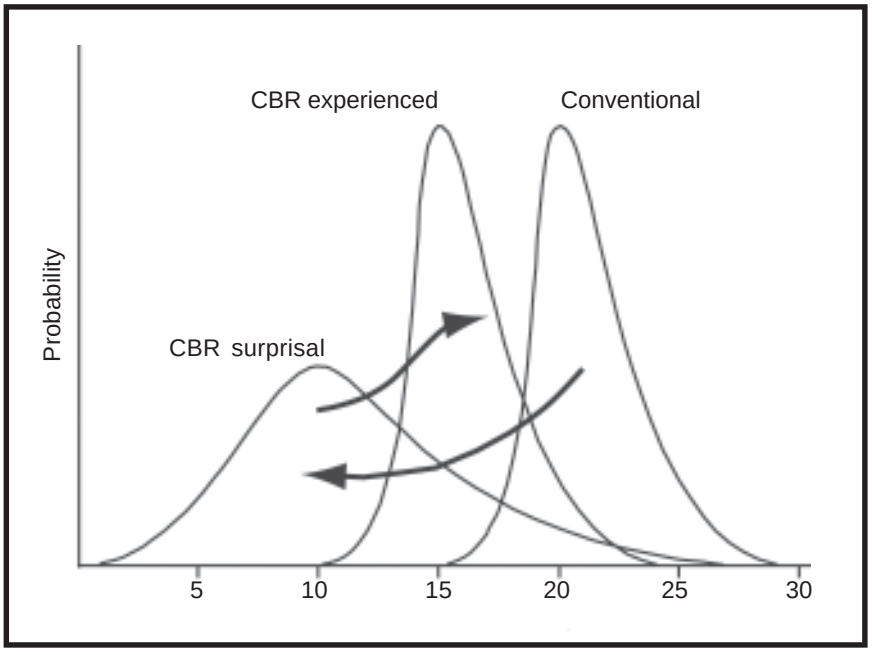

Figure 2. The changing degree of uncertainty in the CBR environment

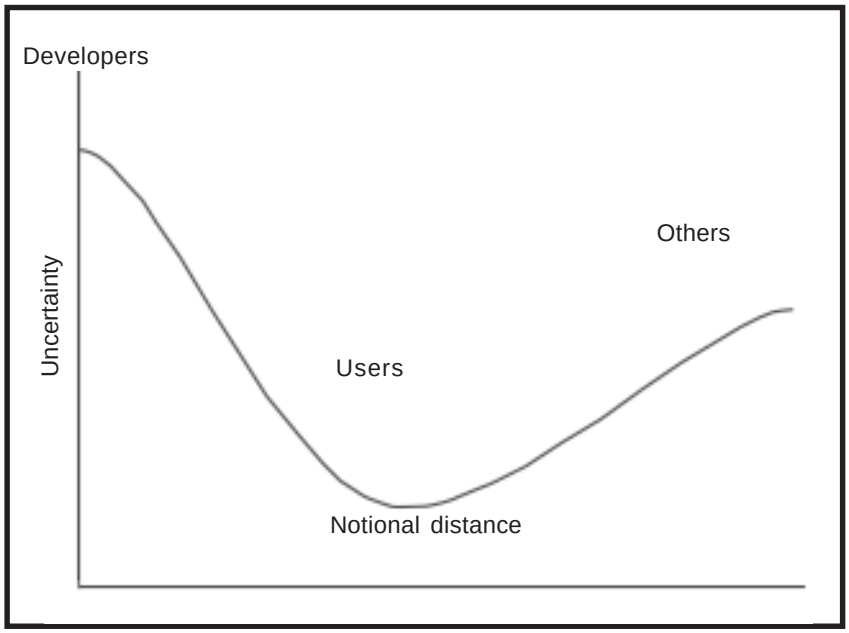

Figure 3. Certainty trough concept

Grim survival calculations aside, there is a considerable difference between the amount of CBR agent required to confidently produce casualties and the amount that will reliably preclude casualties. The contamination of a target with mustard gas can reliably preclude occupation for up to twenty-four hours, but the risk of casualties is still too high for anyone to seriously consider occupying the area for up to a week. Earlier occupation may not result in casualties, but there is still an uncertainty. Likewise, some detection assets cannot distinguish a reasonably safe exposure, making areas with even the lowest detectable quantities less attainable for occupation (see *Figure 4*).[10]

Low-level exposure and latent effects are now the norm in risk assessment. A unit exposed to a mustard gas attack can reasonably assume that 48 percent will suffer temporary blindness for about a week and about 2 percent will have respiratory involvement that will lead to death. What is less apparent at the time of an attack is that about 5 percent of the survivors will likely experience cancer sometime in their lives as a result of this exposure. On the other hand, a force that occupies an area (for about a year) where mustard gas is detected only by smell will experience no casualties, though about 26 percent will develop cancer.[11]

Risk attitudes have changed with time. During World War II, advice on chemical operations suggested that it would be better for US forces to temporarily doff their masks and experience the fringe effects of mustard gas rather than lose the combat edge. After the Gulf War, many veterans commented that the detected levels of sarin from Iraq following US bombing raids were above occupational exposure limits. Such limits were not intended for short-term battlefield exposure, but the expectation remained.

Former military manuals on chemical agents provided good detail on the physical properties of these agents and the dose required for immediate effect. As risk perceptions continue to focus on low-level exposure and long-term health effects, there is a need for future editions of these manuals to provide more intent and low-level exposure details for decision making. Ultimately, risk perception is a question of economics, but

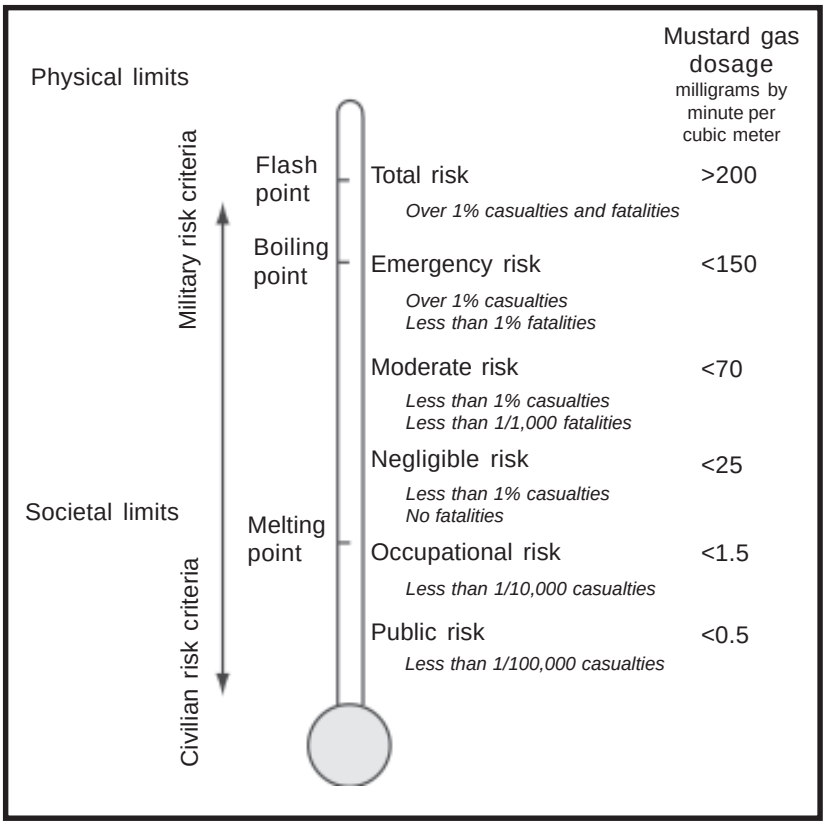

Figure 4. Example of mustard gas exposure risk criteria

it should not be based on economics across the board. There are some areas with more room for risk than others.

Today's Challenge

Consider a situation in which Su-37 aircraft swoop below the inversion cap and spray anthrax over a region of US forces. Though readily detectable as anthrax, how long will it take for commanders to recognize if the attack was actually a gambit with a non-disease-causing vaccine strain? While the identity of the anthrax remains unclear, how will US forces continue their mission? These are the sorts of questions that can be handled through training and preparation.

Studies show that panic is not a common feature in a community forced to evacuate under a technological threat.[12] It should not be assumed that panic would result from the CBR gambit. Leadership with timely and meaningful information alleviates the anxiety and mishaps that can result from the ensuing uncertainty. The most important tool in negating the CBR gambit is to recognize when it is in play. This can be done through timely identification, but it also requires interpretation of a wider scope of information.

Ultimately, the CBR gambit is a trick, a game. When successful, it changes order to disorder and gives an edge to the unconventional. When unsuccessful, it proves an annoyance.

Endnotes

[1] Major General Charles H. Foulkes, *GAS! The Story of the Special Brigade*, Willaim Blackwood & Sons Ltd., London, England, 1935, pp. 66–84.

[2]Amos A. Fries and Clarence J. West, *Chemical Warfare*, McGraw-Hill Book Co., New York, New York, 1921, pp. 23 and 28.

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[4] Julian Perry Robinson, *The Problem of Chemical & Biological Warfare*, Vol. 1, *The Rise of CB Weapons*, Stockholm International Peace Research Institute, 1971, pp. 154–155.

[5] "Report of the Secretary of Defense's 'Ad Hoc' Committee on Chemical, Biological, and Radiological Warfare," 30 June 1950, pp. 19–20.

[6] Lieutenant Colonel Richard Armstrong, *Soviet Operational Deception: The Red Cloak*, US Army Command and General Staff College, Fort Leavenworth, Kansas, 1989.

[7] Claude E. Shannon. "A Mathematical Theory of Communication," *Bell Systems Technical Journal*, Vol. 2, July 1948, pp. 379–423, October 1948, pp. 623–656.

[8] Donald MacKenzie, "Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance," *MIT Press*, 29 January 1993.

[9] Simon Peymer, "Chemical Warfare and Radiation Research in the Former Soviet Union: The Military Medical Academy and Institute of Military Medicine (1970–1989)," *Global Consultants, Inc.*, Alexandria, Virginia, 1992.

[10] The values used in this illustration are from several sources in the 1980s and do not represent current expectations.

[11] Annetta Watson, et al., "Sulfur Mustard as a Carcinogen: Application of Relative Potency Analysis to the Chemical Warfare Agents H, HD, and HT," *Regulatory Toxicology and Pharmacology*, Vol. 10, December 1989, pp. 1–25.

[12] Barbara Vogt and John Sorensen, *Evacuation in Emergencies: An Annotated Guide to Research ORNL/TM-10277*, Oak Ridge National Laboratories, 1987.

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Reducing Vulnerability to Bioterrorists With Biological-Agent Detectors

By Mr. Peter Kushnir, Jr.

Introduction

In September 2001, an unknown person (or persons) sent anthrax spores to several locations by way of the US Postal Service. This biological-agent (bioagent) attack infected 22 people—11 with inhalational anthrax and 11 with cutaneous anthrax. Five people infected with inhalational anthrax died. The American Medical Association recommends "…early antibiotic administration" for inhalational anthrax; however, physicians prefer to diagnose a disease (or medical condition) before administering antibiotics. Initial symptoms of inhalational anthrax are fever, malaise, fatigue, occasional cough, and chest discomfort. The flu-like symptoms of inhalational anthrax may cause physicians to misdiagnose inhalational anthrax as influenza.

Covert dissemination of a bioagent in a public place can go undetected for several days or weeks. There is no immediate impact because of the bioagent's incubation period and the time between exposure and the appearance of symptoms. The covert release of a bioagent could result in a large number of casualties and tax the health care system of the United States. Simultaneous releases of a bioagent at or near US military installations could have a devastating effect.

It is necessary to immediately detect and characterize a bioagent to provide effective treatment and determine what levels of medical resources are required to treat casualties. A networked system of real-time bioagent detectors could provide early warning of an attack by bioterrorists. This article discusses the most likely bioagents and the methods of employment bioterrorists may use. It will state the indicators of a covert agent release and compare the current state-of-the-art biological detectors.

The Threat

What is bioterrorism? The Centers for Disease Control and Prevention define it as "… the intentional or threatened use of viruses, bacteria, fungi, or toxins from living organisms to produce death or disease in humans, animals, or plants." There are many potential bioagents; however, there are six types that experts agree might be used: anthrax, botulinum toxin, pneumonic plague, smallpox, tularemia, and viral hemorrhagic fevers (Ebola) (see the table on *page 22*). Other potential bioagents exist, but the types listed pose a risk to national security. These bioagents were chosen because they—

- Are easily disseminated as aerosols or through transmission from person to person, producing a high mortality rate and the potential for a major impact to public health.
- Require special action for public health preparedness.
- Have the potential for causing public panic and social disruption.

Medical experts have estimated the number of casualties that would occur in the event of a covert release of bioagents. The World Health Organization (WHO) estimates that releasing 50 kilograms of anthrax spores over an urban population of 5 million people would sicken 250,000 and kill 100,000. WHO estimates that a point source release of botulinum toxin would kill or incapacitate

10 percent of persons within 0.5 kilometer downwind of the release point, and an aerosol dispersal of 50 kilograms of tularemia over a metropolitan area of 5 million inhabitants would incapacitate 250,000 persons and result in 19,000 deaths. Typical smallpox epidemics have resulted in mortality rates of 30 percent. Covert dissemination of a bioagent in a public place will not have an immediate impact because of the delay between exposure and the onset of symptoms.

Indicators of a Bioterrorist Attack

The current US agent detection system relies on local health providers to detect and report the outbreak of disease. And the initial detection of a covert release of a bioagent will probably occur at the local level. Disease surveillance systems at the state and local health agencies must be capable of detecting unusual patterns of disease. Components of a public health response to bioterrorism are disease detection and health surveillance, rapid laboratory analysis, and epidemiological investigation and implementation of control measures. However, traditional methods for the detection and identification of bioagents require at least a day for completion. Detecting and responding quickly to bioterrorism is essential. Without special preparation, an attack with bioagents could overwhelm the local civilian and military health systems. Large numbers of patients would seek medical attention, resulting in the need for medical supplies, diagnostic tests, and hospital beds. Those at risk in the public health system include emergency responders, health care workers, public health officials, and civilian and military personnel on military installations.

Potential Threat Agents

Agent	Mortality Rate (Percent)	Incubation Period	Contagious	Symptoms
Anthrax (bacillus anthracis)	90 to 100	7 days	No	Symptoms include fever, malaise, cough, difficulty breathing, toxemia, cyanosis, and terminal shock.
Botulinum toxin (clostridium botulinum)	60 to 100	12 to 72 hours	No	Symptoms include blurred vision, difficulty talking and swallowing, dry mouth, and muscle weakness. Severe symptoms include paralysis of the arms, trunk, and legs.
Pneumonic plague (yersinia pestis)	100	1 to 6 days	Yes	Symptoms include high fever, chills, headache, cough with bloody sputum, severe pneumonia, and sepsis.
Smallpox (variola major)	30	12 to 14 days	Yes	Initial symptoms include malaise, fever, chills, vomiting, headache, and backache. Severe symptoms (2–3 days later) include flat, red spots that progress to puss-filled lesions on the skin and lining of the throat and mouth.
Tularemia (francisella tularensis)	30 to 40	1 to 14 days	No	Symptoms include fever, chills, fatigue, chest discomfort, dry cough, and swollen lymph nodes.
Viral hemorrhagic fevers (filo and arena viruses)	50 to 90 (Ebola) 23 to 70 (Marburg)	2 to 21 days (Ebola) 2 to 14 days (Marburg)	Yes	Symptoms include high fever, severe protration, slight rash, and bleeding (the symptoms may vary depending on the virus).

People seeking medical treatment for symptoms of respiratory illness will likely be the first evidence of a covert release of aerosolized anthrax. Patients infected with anthrax can recover from the disease if antibiotics are administered before the onset of symptoms. However, early diagnosis of anthrax is difficult, especially before any symptoms are evident. Laboratory tests take from six to twenty-four hours, and the test results are only preliminary findings. Early identification of a botulism outbreak depends on the ability of medical personnel to recognize the signs and symptoms of the disease. Aerosol dissemination may be difficult to recognize because a large number of people in the same geographical area will be exposed to the botulinum toxin almost simultaneously. Laboratory tests to confirm botulism can take from one to two days.

An outbreak of pneumonic plague would result in symptoms that resemble severe pneumonia. An indicator of a bioterrorist dissemination of pneumonic plague would be the occurrence of cases in locations where pneumonic plague has not occurred naturally. The sudden appearance of large numbers of previously healthy patients with fever, cough, shortness of breath, and chest pain suggests exposure to anthrax or pneumonic plague. A confirmatory test is required, but laboratory tests for plague take from one to six days. Early administration of antibiotics is helpful in treating plague victims.

An aerosol release of the smallpox virus would disseminate widely because the virus is stable, meaning it remains active in aerosol form. Smallpox is also transmittable from person to person. Initially, the smallpox victim has a high fever, abdominal pain, and severe headache. A rash will appear within one or two days from the onset of symptoms. Since smallpox is a viral infection, there is no antibiotic treatment available. Health care workers can only provide supportive therapy and palliative care. A covert release of aerosolized tularemia in a densely populated area would result in large numbers of people showing respiratory illness. Antibiotics are useful in the treatment of tularemia; however, the symptoms of tularemia also resemble those of respiratory illness. Laboratory identification of tularemia is difficult because the tests screen for the common pathogens that cause respiratory illness.

Biosensors

The Department of Defense is currently working on a biological detection system. This system is a network of sensors and communication links that fill the need for automated bioagent detectors for real-time sample collection, detection, and identification in the field. Such a system has the potential for application in the United States and could be linked into the public health detection and surveillance system. At the heart of the biological detection system is a biosensor.

There are three types of biosensors: chemical mass spectrometry systems, biochemical systems, and biological tissue-based systems. Chemical mass spectrometry systems break down a sample into its component amino acids, biochemical systems detect a DNA sequence or protein, and biological tissue-based systems detect how a bioagent or toxin affects live mammalian cells.

Chemical mass spectrometry systems reduce dependence on live tissue and other biological reagents that must be preserved. Mass spectrometry involves heating a liquid sample until it evaporates and then bombarding the vaporized liquid with electron beams so that the molecules fragment and assume an electrical charge. The charged fragments are then accelerated through an electric field that sorts them by mass and charge and permits the calculation of molecular weights. Mass spectrometry has two advantages:

- It is rapid, with a total detection time of only five minutes (including preparation time).
- It is sensitive enough to detect and identify mixtures of closely related bacterial spores.

Biochemical systems rely on the uniqueness of nucleic acid sequences in self-replicating organisms. A detection method driven by a polymerase chain reaction (PCR) relies on comparing DNA taken from microorganisms in a sample with the DNA of known bioagents. The advantage of using PCR is its ability to produce many copies of the target nucleic acid sequence, allowing for the identification of a pathogen from a small sample in a relatively short time span. The disadvantage of using PCR is the requirement for repeated cycles of samples to be heated close to the boiling point of water and then cooled. This process requires a disproportionate amount of energy to heat and cool the samples. Biological tissue-based systems rely on natural and unique phenomena in organisms. Any chemical compound that triggers an immune response from live tissue can act as an antigen. Antibodies generated from a particular pathogen are specific and will only bind to that pathogen and not to any other pathogen. Immunological detection has the additional advantage of being able to detect both microorganisms and biological toxins, which lack DNA. The drawback of

antibody tests is that they require prior knowledge of the bioagent.

Lawrence Livermore National Laboratory (LLNL) is developing two types of biodetectors for real-time sample collection, detection, and identification in the field. One system uses a miniature flow cytometer. The flow cytometer uses an immunoassay system to look at proteins on the surface of cells. To maximize the detection potential and give faster results, the PCR unit and flow cytometer are being multiplexed to handle multiple samples at once. In 1996, LLNL delivered to the Army a portable, battery-powered, real-time biodetector based on PCR technology. The technologies exist which may be used in a nation-wide system of biodetectors.

Conclusion

This article has addressed the bioagents that terrorists would most likely employ in an attack. Bioterrorists will probably disseminate these agents as aerosols to cause the largest number of casualties. Current detection and identification methods rely on the public health system using epidemiological methods to determine that a bioterrorist attack occurred. Using real-time, networked detectors will speed the identification of bioagents. Early detection and identification will save lives by allowing the packages of bioagent-specific medical supplies to be sent to the attack areas. It is imperative that the sustaining base refine and field a system of networked biodetectors placed in and around population centers and military installations.

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Relooking CBRN Defense Team Training

By Major Jacques A. Walden Sr.

When there is a chemical, biological, radiological, and nuclear (CBRN) threat in the theater of operations, it is important to use the principles of CBRN defense—avoidance, protection, and decontamination. Avoidance begins when a unit occupies a fighting position and starts to set up its chemical and biological detection equipment. Protection involves implementing unit detection capabilities with a chemical-agent alarm or radiological equipment. Decontamination procedures are necessary when it is suspected that a unit has been contaminated. It is the responsibility of the unit to train equipment operators and have personnel ready to respond to the use of CBRN weapons before, during, and after an attack.

As a US Army Reserve chemical officer in the Regional Readiness Command (RRC), I have visited 21 units in 8 major subordinate commands. The units varied in type and included transportation, military police, service and support, quartermaster, medical, ordnance, field hospital, and engineer elements. I understood when I was initially assigned to this position that there would be some CBRN issues to work on due to the absence of a regional chemical officer. But I was ready to take on the challenge and began by implementing a different approach to improving the CBRN training and readiness programs. Instead of going into units and immediately being the "bad guy," I allowed units to conduct self-assessment evaluations using a CBRN inspection checklist. The checklist covered unit CBRN program administration, reference material, standing operating procedures, training, and readiness preparedness. The evaluations allowed the CBRN representative to identify strengths and weaknesses in the CBRN program. Incorporating results from a unit self-assessment evaluation is a great starting point for improving CBRN training and readiness programs.

A Losing Battle

Army Regulation (AR) 350-1, *Army Training and Education*, states that "the commander will ensure that the appropriate section, squad, or platoon has personnel trained to operate and maintain the assigned NBC defense equipment" and "operators of unit NBC defense equipment will be trained to perform operator maintenance and serviceability criteria checks on the assigned equipment." After analyzing the evaluations, I saw that units were not appointing primary and alternate operators or providing training on the use and maintenance of modification table of organization and equipment (MTOE) CBRN equipment. Is it a losing battle to require that CBRN equipment operators be assigned and trained?

The following MTOE CBRN equipment is assigned to Active Army and reserve units to—

- Perform chemical detection operations.
  - M8A1 Chemical-Agent Alarm.
  - Chemical-Agent Monitor (CAM).
  - Improved CAM (ICAM).
- Perform radiation detection operations.
  - AN/VDR-2 Radiac Set.
  - AN/UDR-13 Radiac Set.
  - AN/PDR-75 Radiac Set.
  - IM174 Radiac Set.
  - AN/PDR-27 Radiac Set.
  - IM93 Dosimeter.
  - PP-1578 Radiac Charger.
- Perform protection and decontamination operations.
  - M41 Protective Assessment Test System (PATS).
  - M17 Sanator Decontamination System.

My assessments have shown that the M41 PATS is being utilized to its maximum. This system is used to test and validate the fit and seal of protective masks (such as the M40A1, M17A1, M42A1, and M45). The primary operator of this system is the CBRN noncommissioned officer (NCO) or officer and/or the alternate CBRN representative.

Primary and Alternate Operators

The feedback from units indicates that personnel and leadership do not always fully understand Army regulations. The regulations do not specifically spell out that every unit should have a primary and an alternate operator; however, I believe that this is the intent of the

guidance prescribed in AR 350-1. This is necessary due to the potential turnover in a unit and the chance that the one person most knowledgeable on a piece of equipment may not deploy with the unit.

It is the responsibility of the CBRN NCO to inspect and supervise the operation and maintenance of CBRN equipment. He is also responsible for conducting training on the use and employment of MTOE CBRN equipment. The CBRN NCO is **not** responsible for setting up the M8A1 alarm on the perimeter, conducting chemical-agent monitoring and detection missions, operating radiological equipment, conducting radiation monitoring and survey missions, or operating and maintaining the M17 Sanator. Unfortunately, CBRN NCOs are often misused in this fashion due to the lack of trained specialists.

If units use the primary and alternate operator concept to train soldiers on each piece of CBRN equipment, the unit will be prepared for future CBRN attacks (in the continental United States [CONUS] and outside continental United States [OCONUS]). This will also allow the CBRN NCO to monitor CBRN operations, assess results provided by the operators, and provide advice to the commander. If something happens to the CBRN NCO, the unit can continue its mission by utilizing the already-trained primary and alternate operators.

CBRN Defense Teams

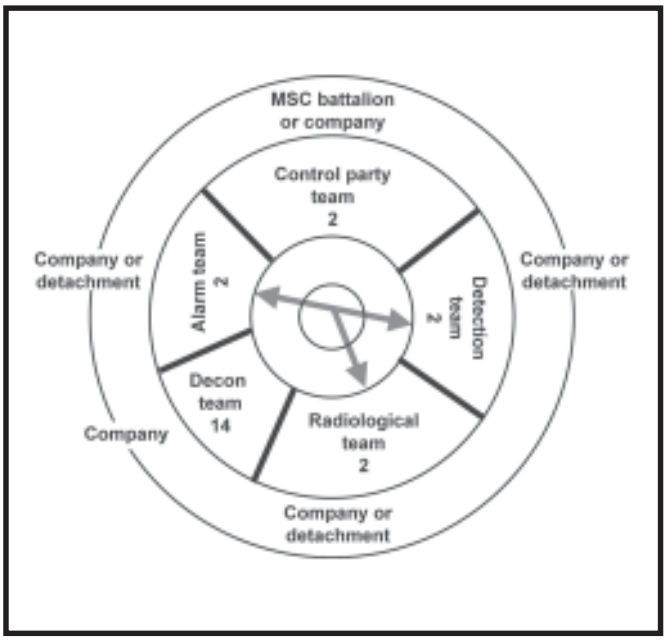
The primary and alternate operators could be described as the unit *CBRN defense teams*. The CBRN defense teams would be a commander's principal responders before, during, and after a CBRN attack. The CBRN defense teams would consist of a—

- **Chemical-alarm team.** The mission of the chemical-alarm team is to provide early warning for the unit.
- **Chemical detection team.** The mission of the chemical detection team is to conduct chemical surveys, perform detection operations, and identify chemical agents.
- **Radiological team.** The mission of the radiological team is to provide the capability to survey, monitor, detect, and measure the intensity of radiation created by fallout from a nuclear weapon.
- **Decontamination team.** The mission of the decontamination team is to conduct a detailed troop decontamination (DTD). A minimum of 14 soldiers is required to operate a DTD site (as described in Field Manual [FM] 3-5, *NBC Decontamination*). Every company must have the equipment required to conduct a DTD.
- **Control party team.** The control party team must be knowledgeable in—
  - Operating the Nuclear, Biological, and Chemical Warning and Reporting System (NBCWRS).
  - Performing unmasking procedures.
  - Plotting simplified fallout predictions.
  - Plotting detailed fallout predictions.
  - Plotting chemical-hazard predictions.
  - Identifying chemical agents and toxins.
  - Requesting decontamination support.
  - Conducting a threat assessment.
  - Conducting radiological monitoring and survey operations.
  - Performing total dose, time-of-entry/time-of-stay calculations, and optimum time-of-exit procedures.
  - Preparing personnel, vehicles, and equipment for crossing contaminated areas.
  - Identifying biological weapons and toxins.
  - Performing CBRN intelligence preparation of the battlefield (IPB) and doctrine procedures.

The figure on the following page outlines the minimum CBRN training requirements. For units that have assigned CBRN defense equipment, there should be a minimum of 22 soldiers trained. A primary and alternate operator for the M8A1 alarm can also operate the detection equipment and radiac equipment. That is, if a unit only has one alarm, one CAM, and one piece of radiac equipment, the unit only needs two soldiers. This is one approach to assigning CBRN operators.

Time To Train

Reserve units have a lot on their plates when it comes to conducting training. How do we find time and keep units and soldiers interested in CBRN defense team training? These units should not have to wait until they are mobilized to conduct training on CBRN defense equipment. The military procures millions of dollars worth of the most technologically advanced equipment in the area of CBRN defense. This equipment cannot be allowed to sit on a shelf and never be maintained or used for training. The challenge for most units is integrating this training into their schedules. With only 24 days a year (2 days or 16 hours



NBC defense team structure

a month) allocated for drill and 14 days of annual training, it appears that there is not enough time for CBRN training. Command emphasis must be present, and units must find innovative ways to include CBRN defense team training into their primary mission. The Active Army has 360 days per year to integrate CBRN training into their training plans. In some cases, reserve units do not have the required CBRN experts to provide the essential CBRN team training. And reserve units are spread across the state, making it more difficult to train. Additionally, a minimum number of CBRN NCO professional development and refresher training courses are conducted (likely due to minimal leadership support or a general lack of interest).

Proposed Courses of Action

If a company with 129 personnel assigned has 6 M8A1 alarms, 12 CAMs, 14 AN/VDR-2s, 1 AN/PDR-75, and 14 AN/UDR-13s (a total of 47 pieces of equipment), 94 soldiers must be trained to operate and maintain the equipment. Where are these soldiers going to come from, and when will they be trained? What are some of the potential courses of action (COAs) to sustain CBRN equipment training? The problem is determining the best training methodology to train all CBRN defense equipment operators in the Reserves. The following COAs could be considered:

- **COA 1.** Conduct distance learning (DL) (Phase I)/hands-on (Phase II) training. The appointed CBRN defense team would train teams in two phases. The Phase I training would be conducted through DL (at home with a compact disk or online for team-specific training). Phase II training would be hands-on training, conducted at the unit by the CBRN NCO or officer or contract subject matter experts.
- **COA 2.** Create mobile training teams. Assign a three-person chemical training team within the RRC to travel and provide CBRN defense team training to units.
- **COA 3.** Conduct DL (Phase I)/hands-on (Phase II) training using US Army Reserve Command (USARC) and US Army Chemical School (USACMLS) personnel. The appointed CBRN defense team would train teams in two phases. Phase I training would be conducted through DL; Phase II would be conducted using USARC and/or USACMLS subject matter experts. The designated subject matter experts would travel to designated unit sites to conduct the training as required.
- **COA 4.** Implement an MTOE or doctrine change. Design a CBRN detachment specifically focused on performing CBRN defense team tasks, missions, training, and equipment maintenance. The detachment, which would consist of 8 to 22 members, would act as the CBRN response experts for a major support command or brigade.
- **COA 5.** Establish CBRN training teams. The CBRN subject matter expert in each unit would implement a training plan or strategy.
- **COA 6.** Instruct units to send appointed operators to CBRN defense team training courses.

My recommendation would be to implement COA 1. Additionally, the following factors could be considered in the decision process:

- Screening criteria.
  - Do all of the major support commands have a CBRN NCO or officer appointed to monitor the progress of the program in subordinate units?
  - Do all units have appointed (by memorandum) CBRN equipment operators?
  - Are all team members able to gather together for the training?
  - Do all appointed operators have access to a computer?

- Evaluation criteria.
  - What is the best training methodology to sustain operator performance?
  - How can the training be easily integrated into training schedules?
  - What type of training is the most cost-effective?
  - What is the minimum amount of training time required?

The integration factor should be considered over all criteria. And the cost criteria should be considered the second priority. Cost criteria should include financial and unit survivability factors. The most advantageous method should be determined at the higher-echelon level (at the US Army Training and Doctrine Command [TRADOC], USARC, or USACMLS) to determine what is best for the Reserves. My attempt is only to give a starting point for discussion among the chemical and training communities.

Training Initiative

When I was a battalion chemical officer in 1986, CBRN team training was a requirement, but it was also fun and challenging. The leadership was very supportive of a biannual CBRN defense team competition known as *Olympic Dragon*. The battalion appointed 1 chemical-alarm team (with 2 soldiers), 3 detection teams (with 2 soldiers each), 2 radiological teams (with 2 soldiers each), several decontamination teams (with 13 soldiers each), and 1 control party team (with an NCO [in military occupational specialty 74D], an officer, and an NCO alternate) and trained them to task, condition, and standard.

Two written tests were administered prior to the exercise evaluation—a ten-question test specific to CBRN functions and a team-specific test. A battalion level competition was conducted to determine the teams that would compete at the brigade level competition. The top three teams in each category at the battalion and brigade levels received recognition. This competition did three things:

- Developed a sense of importance and pride in CBRN defense team training.
- Prepared soldiers and ensured that they were able to conduct the required task before, during, and after a CBRN attack.
- Instilled cohesion and esprit de corps.

This same evaluation concept could be incorporated in reserve training. The 12 RRCs could have a CBRN team competition, with each RRC sending its teams to an approved location to compete (such as to USACMLS at Fort Leonard Wood). Each major support command would conduct its own CBRN defense team competition based on the standards set by USACMLS or USARC.

Conclusion

Do reserve units need trained CBRN equipment operators? If we look at the threat today, the answer is a definite "Yes." Since 11 September 2001, and with all of the concerns about weapons of mass destruction and the requirement for increased homeland security initiatives, there is a need for increased CBRN training. Reserve units may be called up to support the homeland security mission or to deploy to a hostile environment with a possibility of CBRN threats.

DL is becoming a vital part of military training and education. There is interactive multimedia instruction (IMI) being developed to train basic and advanced military occupational specialty skills. IMI products in development include the M8A1 alarm, radiological equipment, and CAMs. As a CBRN training developer, I have found that these IMI products would be a great link to developing and training CBRN equipment operators.

My observations have led me to believe that this is a subject worthy of review by the chemical community. We need to establish a strong CBRN defense operator training effort for reserve units everywhere.

Acknowledgements: I would like to recognize First Sergeant Hubert Quiller (Retired), First Sergeant Gerald Mather (Retired), and Albert J. Mauroni (author of *Chemical-Biological Defense*) for reviewing and providing feedback on this article.

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NATO Develops NBC Defense Capability

By Lieutenant Colonel Wayne L. Thomas

The development of a multinational chemical, biological, radiological, and nuclear (CBRN) battalion is currently underway. The new battalion concept was developed in response to a requirement to fill the gap in the CBRN capability that exists across many North Atlantic Treaty Organization (NATO) formations. As its name indicates, the battalion is comprised of units (or subunits) from NATO. The purpose of the battalion is to provide the new NATO high-readiness forces (HRFs) with a viable nuclear, biological, and chemical (NBC) defense capability.

This initiative was endorsed by NATO defense ministers in June 2002 and approved at the Prague Summit in November of the same year. At the meeting, it was agreed that many NATO nations had an NBC defense shortfall. And given the current weapons of mass destruction (WMD) threat, this capability is a must for providing force protection for the new NATO HRFs.

The CBRN battalion concept is based upon the existing battalion headquarters structure and is augmented by other donor nations to meet the required packages and mission requirements. Additional capabilities to meet specific threats are available on a graduated readiness level. The mission of the battalion (with its attached and assigned subordinate elements) is to rapidly (within five to ten days) provide credible and appropriate NBC defense capability, primarily to deployed NATO joint forces and commands, while maintaining alliance freedom of action in the NBC threat environment. The battalion maintains decontamination and NBC reconnaissance operations and biological detection capabilities in a mobile laboratory capable of supporting identification and confirmation missions. Additionally, the battalion has a joint assessment team to supplement the existing NATO headquarters staff. The battalion can serve as the NBC defense force provider to fulfill NBC unit requirements, including NATO consequence management operations (CBRN events) in NATO response force (NRF) or other NATO operations.

The concept for the CBRN defense battalion is based on a lead nation providing a lion's share of the resources and responsibility (using the existing battalion structure),

CBRN laboratory

with mission-critical assets provided by other NATO nations. The lead nation also has the overall responsibility for commanding the unit, to include implementing and maintaining standing operating procedures, planning and conducting collective training, and maintaining specified deployability readiness. The battalion is trained and certified to standards set by NATO strategic commanders and approved by the mission commander. The plan is to have multiple battalions, selected to serve a fixed period, rotate among the framework of selected lead nations. Identical to the NRF, the multinational battalions will conduct training, evaluation, and certification operations six months before entering the operational standby period. The multinational composition of the CBRN defense battalion dictates a necessity for preplanned integration and interoperability training opportunities during this six-month

Multinational decontamination team training

period. The required end state of the training, exercise, and evaluation periods is a combat-ready force that is capable of providing qualified NBC defense to support the full spectrum of NRF operations. The force will be able to conduct all assigned military and NBC defense missions and supporting tasks.

The force must be evaluated and certified before entering the standby period. Prior to the standby period, the training focus, at a minimum, will be on integration and interoperability training and joint-force, combat support integration training. Additionally, the land component commander (LCC) assigned to the NRF rotation will be designated by the Supreme Allied Commander Europe (SACEUR) as being responsible for incorporating the training requirements and exercise programs that prepare the HRF headquarters to perform NRF standby missions as the LCC.

The Czech Republic has the role of the lead nation for the first multinational CBRN battalion rotation; Germany will assume the role for the second rotation (see *Figures 1 and 2*). The lead nations for follow-on rotations are still being negotiated. The unit makeup of the first CBRN battalion shows the uniqueness of the unit. Thirteen countries provide various capabilities, ranging from biological detection assets (from the United Kingdom) to explosive ordnance disposal (EOD) (from Portugal). The multinational CBRN battalion achieved full operating capability (FOC) in July 2004, and the German contingent achieved FOC in December 2004.

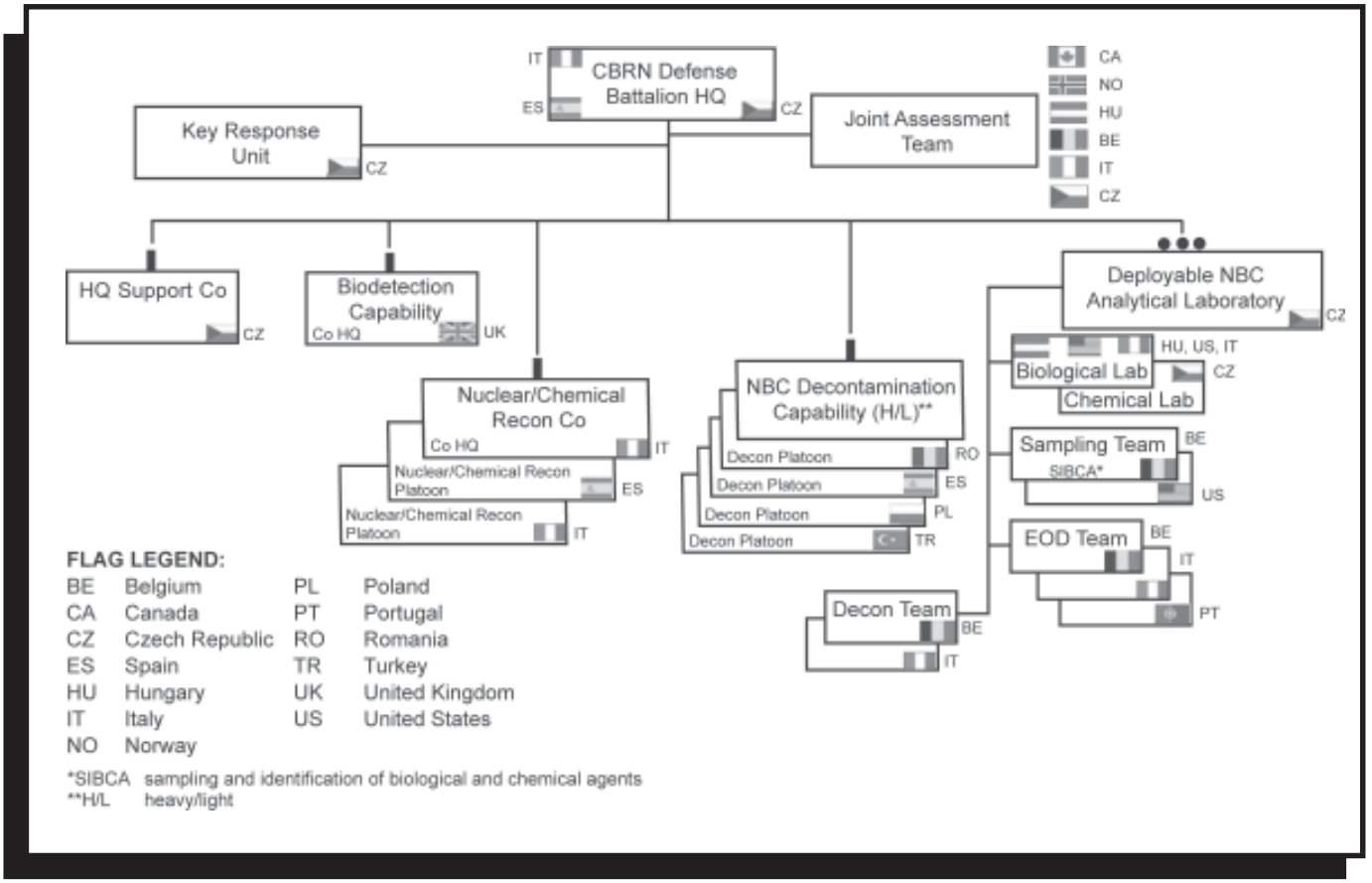

Figure 1. NATO CBRN defense battalion (first rotation)

Many challenges exist in the training and organizational phases of the rotation. These challenges include language barriers, differences in training standards, diversified equipment, and variations in raw decontaminants and chemicals used in detection sets and decontamination operations. And perhaps the greatest challenge is bringing these components together at the right place, at the right time, to meet the NRF deployment timelines and NATO's new strategic focus. These are considerable obstacles for any unit to overcome, especially a multinational unit brought together for six months. These challenges are formidable, but the success of the multinational CBRN defense battalion is critical to NATO's new HRFs.

Multinational chemical reconnaissance team training

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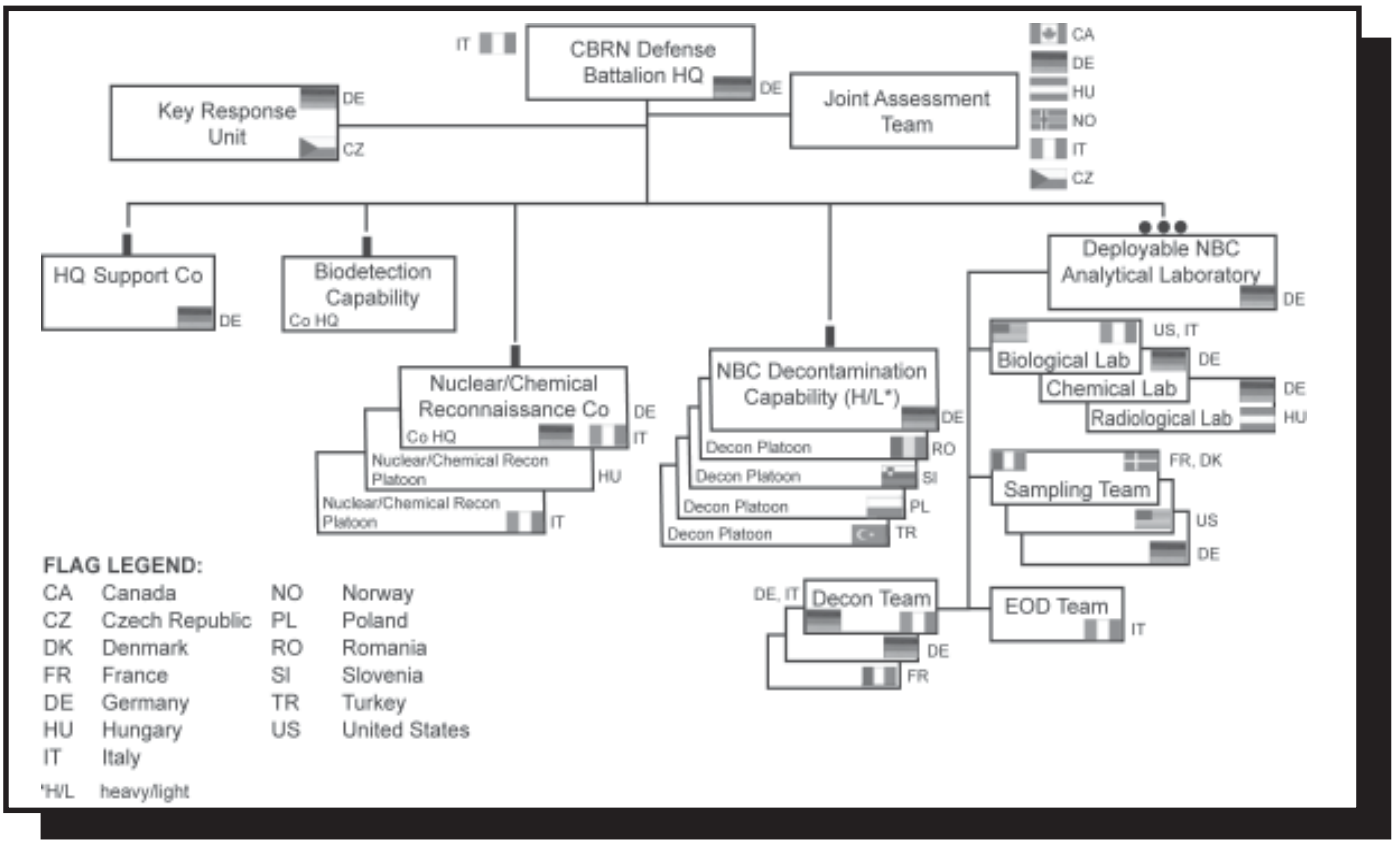


Figure 2. NATO CBRN defense battalion (second rotation)

MASKS FOR THE AIR SERVICE:

UNITED STATES AIR FORCE MASKS THROUGH THE DECADES

By Lieutenant Colonel Robert D. Walk

Since their inception as a separate service in 1947, the US Air Force (USAF) has always cared for their airmen. Initially, they followed the Army's lead in mask development, but later adopted USAF-specific solutions as needed. They have run separate programs for their aircrew and their ground support personnel to ensure the best protection. This article will look at the history and continuing efforts of the USAF to provide protection from chemical, biological, radiological, and nuclear (CBRN) inhalation hazards.

Aircrew Masks

The USAF must be able to attack the enemy under any hazardous condition—including a CBRN event. Over the years, USAF leaders have developed ejection seats to ensure aircrew survival from stricken aircraft, improved flight helmets to protect the head and neck, and improved oxygen masks to ensure good air supply. While not ignored, protecting the aircrew from the effects of CBRN hazards has not always had the highest priority. For many years, the USAF assumed that the aircrew would breathe using the aircraft's oxygen supply and would not require additional respiratory protection. On the ground, the aircrew would use the standard ground protective mask and receive oxygen through a clean air supply. This idea originated during World War II and appeared to have continued through the 1960s. However, during the Vietnam War, an experimental aircrew version of the M28 riot control agent mask was produced.

In 1971, realizing the need for a chemical-biological (CB) protection helmet for fighter pilots, the USAF tested a modified HGU-15/P "clamshell" helmet. Modifications to the helmet included adding a filter element to the oxygen system, a nosecup, an inlet check valve, a drinking tube, a Valsalva (pressure equalizing) valve, a low-pressure hose, and electrical system modifications. Additionally, a neck seal was included that functioned much like the hood on other masks. The seal, made of butyl-coated nylon fabric, fully covered the shoulders and extended over the chest. A cord could then be tightened around the neck to keep the seal tight. A total of 16 masks were manufactured—4 from the original HGU-15/P mask design (with the filters mounted inside the helmet) and 12 from the final design (with the filters carried externally). The masks were successful in that they protected the user, but the USAF never adopted them.[1]

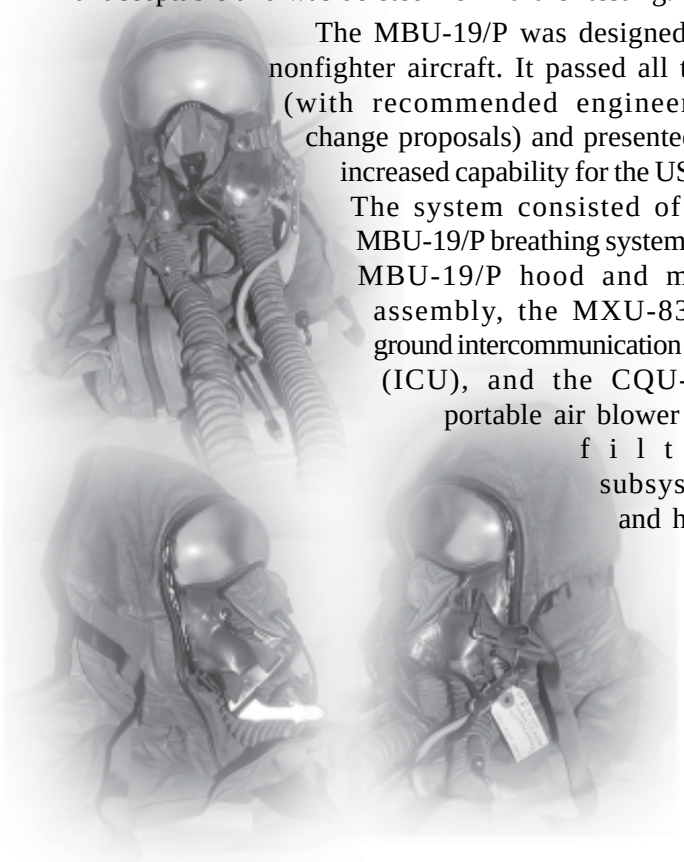
By 1975, the USAF had adopted the mask breathing unit (MBU). This unit consisted of the MBU-13/P CB oxygen mask, the HGU-41/P protective hood and shoulder cowl, and the CRU-80/P filter pack (which used the then-standard, M13-series filters). While the mask did provide protection for the aircrew, it was not perfect. It reduced the user's field of vision, was poor fitting, had no Valsalva or drinking capability, and did not work with the advanced-concept ejection seat (ACES) II. By the early 1980s, the mask needed replaced. However, despite inadequacies, the mask is still authorized for use today.

HGU-15/P clamshell helmet

In the 1980s, with continued interest and knowledge that the Russian colossus had and would most likely use chemical agents, the USAF continued their efforts to field a mask for aircrews. The USAF sent out requests for mask designs and received a great response from firms in the United States, Great Britain, and Germany during the Phase I evaluation. The design submissions included the Tactical-Aircrew Eye Respiratory System (TAERS) (submitted by ILC Dover, Incorporated); the Advanced Chemical-Defense Aircrew Respirator (ACDAR) (submitted by Scott Aviation, Incorporated); the Protective Integrated Hood Mask (PIHM) (submitted by ILC Dover, Incorporated); the German Chemical Respirator System; and the British Nuclear, Biological, and Chemical (NBC) Aircrew Respirator-5, Mark I and II. These masks were evaluated on five different aircraft—the F16B, F15B, F4E, UH-1N, and KC-135E. In Phase II, the selected systems (TAERS and PIHM) were designated the MBU-18/P and MBU-19/P, respectively.

The MBU-18/P was specifically designed for high-performance fighter aircraft. This system was tested extensively in fighter aircraft, but it was ultimately declared unacceptable and was deleted from further testing.

The MBU-19/P was designed for nonfighter aircraft. It passed all tests (with recommended engineering change proposals) and presented an increased capability for the USAF. The system consisted of the MBU-19/P breathing system, the MBU-19/P hood and mask assembly, the MXU-835/P ground intercommunication unit (ICU), and the CQU-7/P portable air blower and filter subsystem and hose.



ACDAR mask

MBU-13/P CB oxygen mask, HGU-41/P protective hood and shoulder cowl, and the CRU-80/P filter pack

The new mask design integrated the standard MBU-12/P oxygen mask, which included a visor, a neck dam, a bromobutyl rubber hood, a drinking tube, and a communications connection. It attached to the standard USAF HGU-55/P helmet with standard connectors. The breathing subsystem used a standard C2 filter canister, hose, and manifold for emergency oxygen. The blower unit used a standard C2 filter canister with batteries and an external power cable. Finally, the ICU allowed for communication with others while protected and not connected to the aircraft communication system. However, the aircraft required a modification consisting of a mounted blower unit and a 28-volt, direct-current power outlet (Class II modification).[2]

The onset of Operation Desert Storm created an urgent need for protection for the tactical aircrew. The MBU-19/P was hastily modified and tested for use in high-performance fighter aircraft. While an improvement in both comfort and visibility over the older MBU-13/P, the modified mask was not recommended for type classification because of problems with excess oxygen demand and limited mission time.[3]

After the first Gulf War, the US military had six different aviation masks: the MBU-13/P (USAF), the MBU-19/P (aircrew eye and respiratory protection [AERP]) (USAF), the AR-5 variant (US Navy and US Marine Corps), the M24 (US Army and US Marine Corps), and the M43 (Type I and Type II) (US Army). The masks represented five unique solutions and had no interchangeable parts between them. With increasing cooperation between the services and new emphasis placed on integrated logistics, it was easy to see the need for a joint aviation mask solution.

Joint Services Aircrew Mask

In 2000, the Joint Services Aircrew Mask Program was initiated to develop, manufacture, and field a mask system to protect the aircrew from CBRN environmental hazards. The goal was to manufacture a product, which was similar to the AERP mask and included a hood, an oral-nasal mask and lens assembly for the head, and a battery filter-blower assembly. The objective of creating a standard mask with only minor variations between models was extremely optimistic. The designers were faced with creating a mask, from numerous helmet designs, with varying missions and cockpit requirements. The new design needed to work for the aircrews of the C-17 and KC-135 (roomy transport aircraft) and the aircrews of the F-117 Nighthawk and F-15 Eagle (cramped fighter aircraft). Additionally, the mask needed to work across the services to the Navy and Marine Corps F-18 and AV-1 Harrier. And finally, the mask needed to be easily usable with USAF helicopter requirements (UH-60 variants), Navy helicopter requirements (UH-60 variants), Marine Corps helicopter requirements (UH-1W and AH-1S), and Army helicopter requirements (including the AH-64 Apache, which had unique requirements). It was clear that it would be difficult to achieve good program results in a short period of time.

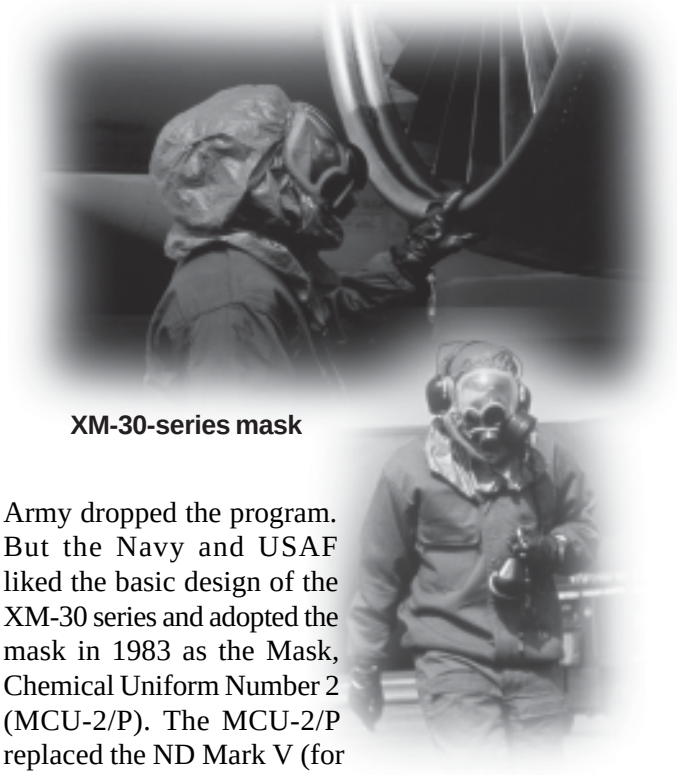
A mask program like the Joint Service Aircrew Mask (JSAM) Program starts off with a program design risk reduction (PDRR) effort, followed by a system design and development (SDD) phase and then production. The preparatory design work on the mask design is performed during the PDRR phase, and the final mask design is produced during the SDD phase.

The PDRR for the JSAM resulted in two prototype masks produced by two design teams—one from Science Applications International Corporation (SAIC) (with Scott Aviation Corporation as a partner) and one from the Gentex Corporation. These new mask designs formed the basis for the design proposals submitted for consideration in the SDD phase. Scott Aviation, rather than SAIC, submitted a mask for consideration and was awarded the contract. Gentex went on to file a protest, citing the lead switch from SAIC to Scott, but the decision was upheld after a lengthy review. Scott Aviation continues to produce the JSAM mask today.[4]

USAF General Issue Masks

When the USAF became a separate service in 1947, they brought with them the standard Army mask for nonaviators and continued to use the masks through the 1950s and 1960s. While these masks—the M3, M4, M5, and M8 (World War II masks) and the M9- and M17-series masks—were good masks, technology was advancing and new ideas emerged.

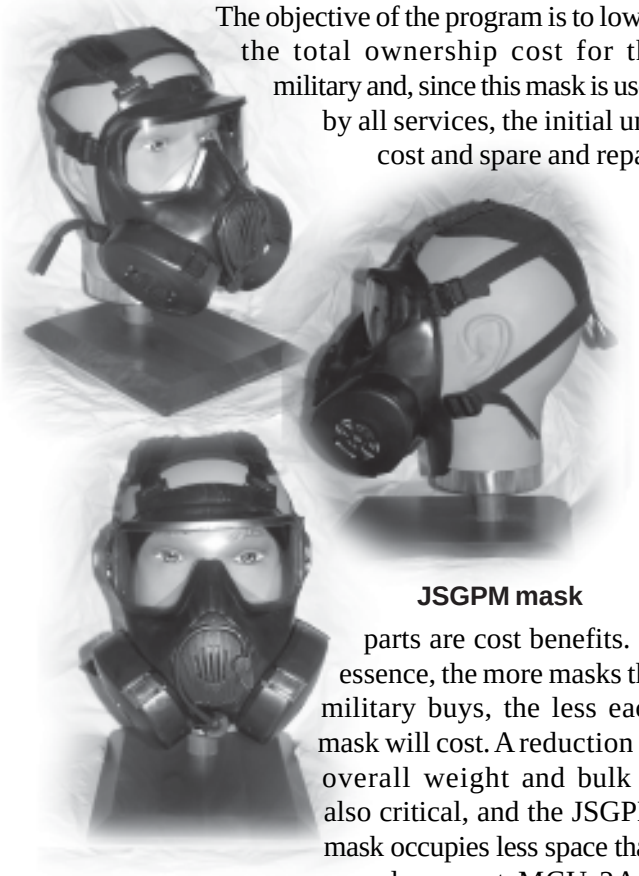
In the 1970s, the military began to explore the use of silicone for aviation purposes and for use in chemical warfare defense. Silicone was considered a wonder material because it did not produce allergic reactions and was flexible so that anyone could be fitted with a mask. Using silicone as the faceblank material, the Army created a joint program to replace the myriad of standard masks with the newly designed XM-29 and XM-30-series masks. However, after receiving unacceptable test results, the Army dropped the program. But the Navy and USAF liked the basic design of the XM-30 series and adopted the mask in 1983 as the Mask, Chemical Uniform Number 2 (MCU-2/P). The MCU-2/P replaced the ND Mark V (for forces afloat) and the M17-series masks (for forces ashore), easing a big logistical burden. The new features of the mask included two voicemitters (one for speaking and one for use with a telephone), a nose cup to minimize eye lens fogging, a spectacle insert capability, and an opening to drink from a canteen. The North Atlantic Treaty Organization (NATO) standard C2 filter canister could be mounted on either side of the face piece, and an outsert could be added for scratch and sun protection. The MCU-2/P was later altered to fit a microphone pass and was redesignated the MCU-2A/P. The new mask design, which was available in sizes small, medium, and large, was the primary mask used by the USAF during Operation Desert Storm (in addition to M17-series masks remaining in the system). Seeking to further improve the voice transmission of the mask, the USAF used the same voicemitter amplifier as the Army (the M7) and bought an improved, although nonstandard, variant.



XM-30-series mask

Joint Services General-Purpose Mask

As technology advanced, the USAF continued the search for a better mask than the MCU-2/P. The USAF is a full partner in the Joint Services General-Purpose Mask (JSGPM) program. The JSGPM is a lightweight, inexpensive, and compact mask issued to all military personnel. The JSGPM system consists of two masks: the XM50 general-purpose mask and the XM51 for armored-vehicle operators. The mask can be readily converted from the XM50 to the XM51 and vice versa by adding or removing a microphone and hose. These masks are tested against standard industrial chemicals to ensure user protection in a modern toxic environment. The objective of the program is to lower the total ownership cost for the military and, since this mask is used by all services, the initial unit cost and spare and repair parts are cost benefits. In essence, the more masks the military buys, the less each mask will cost. A reduction in overall weight and bulk is also critical, and the JSGPM mask occupies less space than a replacement MCU-2A/P face piece.



JSGPM mask

The PDRR base developmental contract for the JSGPM was awarded to Avon Rubber and Plastics on 30 March 2001. Avon is the manufacturer of the FM12 and S10 military masks for the United Kingdom and many other NATO countries. The company brought a wealth of knowledge with it when it began development on the JSGPM program, and the program continues to do well. The PDRR is complete, and the mask has been further refined. The most obvious difference from the original PDRR mask is the extended cape under the chin, which allows the mask to be used with the Joint Service Lightweight Integrated Suit Technology (JSLIST) protective suit. This variant is currently undergoing testing and is expected to go into production in 2006.

Conclusion

The USAF is a full partner in the Joint Chemical and Biological Defense Program. Through the JSAM and JSGPM programs, they are seeking improved levels of respiratory protection. While the JSAM program is technologically challenging, the USAF continues to work on developing a jointly interoperable protective mask for all aircrew personnel—USAF, Navy, Marine Corps, Coast Guard, and Army.

Endnotes

[1] *"Modification of Flight Rated Helmet HGU-15/P for Use in Protective Mask Studies: Final Report,"* Robert Controls Company, Anaheim, California, March 1971.

[2] *"Aircrew Eye/Respiratory Protection (AERP) Program Development Test and Evaluation (DT&E)-MBU-19/P Chemical Protective Hood/Mask Assembly Evaluation,"* AFDTC-TR-93-72, Eglin Air Force Base, Florida, November 1993.

[3] *"Aircrew Eye/Respiratory Protection (AERP) System"* TAC Project 86-063T, Eglin Air Force Base Florida, January 1991.

[4] *"Gentex Corporation–Western Operations,"* 25 March 2003, B-291793, B-291793.2, B-291793.3, *<http://www.gao.gov/decisions/bidpro/291793.htm >*, accessed on 22 April 2004.

Lieutenant Colonel Walk is an Active Reserve chemical officer currently assigned to the Army G8. He is a graduate of the US Army War College, the US Army Command and General Staff College, and the US Army Chemical School. He has held commands at the detachment, company, and battalion levels. Lieutenant Colonel Walk is a qualified hazardous-materials technician and a Pennsylvania Essentials trained firefighter.

Care to Comment?

The *Army Chemical Review* welcomes letters from readers. If you have a comment concerning an article we have published or would like to express your point of view on another subject of interest to chemical soldiers, let us hear from you. Your letter must include your complete address and a telephone number. All letters are subject to editing for reasons of space or clarity.

Our mailing and e-mail addresses are—

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The 332d Chemical Company Makes History

By Mr. Lance Feyh

The 332d Chemical Company made history during an activation ceremony in September at Fort Leonard Wood, Missouri. The company, headquartered in Fayetteville, Arkansas, is the first Biological Integrated Detection System (BIDS) organization in the history of the US Army to contain both Active Army and reserve component personnel.

Company platoons will use BIDS to identify the presence of biological particles (such as anthrax) in the air. BIDS is configured to detect various characteristics that are indicators of a biological attack, and it provides a presumptive identification capability. The results of the identification process are reported, and biological samples are evacuated to preselected sample transfer points for further analysis. This information provides commanders with the capability to assess whether a large-scale biological attack has occurred. The BIDS is mounted on a high-mobility, multipurpose wheeled vehicle (HMMWV) and can be used in field or homeland security missions.

BIDS unit

Photo by Katie Hahn

The Commander of the 460th Chemical Brigade hands the Commander of the 332d Chemical Company the unit guidon during the activation ceremony.

Under reserve command, the 332d Chemical Company consists of two Active Army platoons and two reserve platoons. The Active Army platoons are located at Camp Carroll, South Korea. The reserve platoons are located in Fayetteville, Arkansas, and Broken Arrow, Oklahoma, with detachments in Norman and McAlester, Oklahoma. Reserve platoons will rotate through Korea for training when Active Army platoons return stateside, but the reserve platoons plan to train as a unit in the summer of 2005. According to the unit commander, the 332d needs to be trained and ready to respond to threats immediately after receiving the BIDSs. The 332d Chemical Company falls under the 468th Chemical Battalion, 460th Chemical Brigade, 90th Regional Readiness Command.

Mr. Feyh is a staff writer for the Fort Leonard Wood Guidon newspaper.

Top Leaders Designate Chemical Corps the "Force of the Future"

By Master Sergeant Joseph Baker

Hundreds of soldiers, some coming from as far away as the ongoing operations in Iraq, made the trip to Fort Leonard Wood, Missouri, for the twenty-first annual Worldwide Chemical Conference. Attendees were welcomed by Major General Randal R. Castro, Commanding General of the US Army Maneuver Support Center, and Brigadier General Stanley H. Lillie, Chief of Chemical. During his motivational welcome to Fort Leonard Wood, Major General Castro reminded the audience of the importance of the Chemical Corps and the role the Corps plays as the Force of the Future. Brigadier General Lillie focused his presentation on the capabilities of the Chemical Corps in the 21st century.

Major General Randal R. Castro welcomes conference attendees.

Brigadier General Stanley H. Lillie shares his vision for the Corps.

The three-day event featured several keynote speakers, including Lieutenant General William Wallace, Commanding General of the US Army Combined Arms Center and Fort Leavenworth; Dr. Dale E. Klein, Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs; Brigadier General Klaus O. Schafer (Retired), M.D., M.P.H., Acting Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense; Ms. Lisa Bronson, Deputy Under Secretary of Defense for Technology Security Policy and Counterproliferation, Office of the Under Secretary of

Defense for Policy; Colonel Jean D. Reed (Retired), Professional Staff Member, House Armed Services Committee; Brigadier General Steve Reeves, Program Executive Officer for Chemical and Biological Defense; and Brigadier General Walter Busbee (Retired), chairman of the Chemical Biological Defense Division, National Defense Industrial Association. The event also hosted the presentation of the Major General William L. Sibert award, given annually to the top Active Army and reserve component chemical units (see the article below for additional information regarding the Sibert Award). Additional events included the ribbon-cutting ceremony and dedication of the new gift shop in the Chemical Museum, the induction of new Hall of Fame members, and recognition for distinguished members of the Corps.

The conference opened events with a regimental review, where Brigadier General Patricia L. Nilo (Retired) was honored for the years of service she provided to the Chemical Corps. The week ended with the Green Dragon Ball, where more that 900 attendees heard Major General John C. Doesberg, Commanding General of the US Army Research, Development, and Engineering Command, inspire the Corps with his words of wisdom.

Master Sergeant Baker is the Chemical School Operations Noncommissioned Officer. His past assignments include instructor for the Headquarters, US Army Training and Doctrine Command; tactical noncommissioned officer for the chemical Officer Basic Course; platoon sergeant for chemical reconnaissance; and division chemical noncommissioned officer for the 1st Infantry Division. Master Sergeant Baker is the author of Looking Out From Under the Hat.

Chemical Companies Receive the Elite Sibert Award

The 12th Chemical Company and the 392d Chemical Company received the esteemed Sibert Award from the Chief of the Chemical Corps/US Army Chemical School Commandant on 13 October at the 2004 Worldwide Chemical Conference held at Fort Leonard Wood, Missouri. The Sibert Award provides recognition for excellence in the Chemical Corps and gives recognition to the best chemical company-size unit in the Army.

The award is named after Major General William L. Sibert—often referred to as the "father of the Chemical Corps." Major General Sibert, who was elected by General John J. Pershing to stand up the Chemical Warfare Service, guided the Corps through many of its earliest challenges. Units compete for the highly regarded Sibert award based on their—

- Mission.
- Individual and collective training statistics, such as—
  - Common task testing.
  - Weapons qualification.
  - Army physical fitness test scores.
  - Army Training and Evaluation Program (ARTEP) results.
  - External support systems.
  - Number of training center rotations.
- Overall maintenance status and performance-on-command inspections.
- Accident and award safety performance statistics.
- Overall organizational excellence (based on individual and unit awards).
- Participation in educational programs and community or humanitarian activities.
- Battle-focused future training initiatives.

The 12th Chemical Company is part of the 1st Infantry Division and is attached to the 701st Support Battalion. The 392d Chemical Company (Recon), from Little Rock, Arkansas, is part of the 90th Regional Readiness Command.

Chemical Distance Learning Products

Compiled by Tahnee Moore

Nuclear, Biological, and Chemical (NBC) Reconnaissance Course

This distributed learning (DL) course will be Phase I of NBC reconnaissance training and will be a prerequisite for students attending the NBC Reconnaissance Course, L5 (Phase II, institution training). The DL portion provides lessons in basic reconnaissance operations, including vehicle operations, reports, reporting procedures, an introduction to NBC reconnaissance, NBC sampling and marking operations, an operations overview, and an introduction to the Precision Lightweight Global Positioning System Receiver (PLGR). This DL product will be released in Fiscal Year (FY) 2006.

Biodetection Unit Leaders (BUL) Course

This course focuses on the skills and knowledge required to lead a Biological Integrated Detection System (BIDS) platoon on the battlefield. The course lessons include biodetection operation plan/operation order (OPLAN/OPORD) information requirements; biodetection planning, preparation, and execution operations; biodetection operations on the battlefield; biodetection systems employment on the battlefield; biodetection company critical nodes and area array planning; biodetection unit report assessment; biological warfare agent sample evacuation planning; and BIDS contractor logistics support (CLS). This 40-hour course for BIDS leaders will be available in FY 06.

Biodetection Systems Common Subjects Course

This DL course will be a prerequisite for students attending the Preplanned Product Improved BIDS (M31A1/P3I) Course or the Joint Biological Point Detection System (M31A2/JBPDS) Course. The DL portion will be Phase I of training and the BIDS P3I or BIDS JBPDS institutional training will be Phase II. The DL course lessons include introductions to the BIDS M31A1/P3I and the M31A2/JBPDS, basic biology, the biological environment, and biological laboratory operations and safety procedures. The DL will be available in FY 06.

Nuclear, Biological, and Chemical (NBC) Defense Course

This course is designed to teach Active Army and reserve component officers and noncommissioned officers the skills they need to work at the company and detachment levels. This training program is compatible with the resident instruction provided by the US Army Chemical School. Phase I of this course was designed to be delivered as DL training and contains approximately 54 hours of instruction. Phase I should be followed by the resident Phase II course—NBC Room Operations. The Phase III course, NBC Defense Operations, will be fielded in FY 05.

Veterans From the 2d Chemical Mortar Battalion Attend Reunion and Exhibit Dedication

By Mr. Kip A. Lindberg

The US Army Chemical School at Fort Leonard Wood, Missouri, hosted veterans of the 2d Chemical Mortar Battalion at their annual reunion on 12 October 2004. Eight veterans, along with their wives and families, participated in a full day of activities designed to honor the men for their service during World War II and the Korean War.

After a stirring address by Regimental Command Sergeant Major Patrick Alston, the veterans laid a wreath at their battalion monument in the Chemical Corps Memorial Grove. A memorial service followed at the adjacent World War II Chapel, where Brigadier General Stanley H. Lillie, Chief of Chemical and Commandant of the US Army Chemical School, paid tribute to the enduring sacrifices made by the members of the 2d. The veterans and their families were honored that Brigadier General Lillie would take time from his busy schedule to meet with them, especially since the reunion coincided with the Worldwide Chemical Conference.

Following the memorial ceremony, the Chemical Corps Museum unveiled an exhibit dedicated to the 2d Chemical Mortar Battalion. The exhibit, a blend of uniforms, weapons, equipment, photographs, and a life-size diorama combined to relate the lineage and history of the battalion. One veteran remarked on the exhibit unveiling: "I don't know if they got it finished and held it up for us or had to rush to get it ready, but either way, it was damn nice of them!" Following the exhibit unveiling, the museum staff led the veterans on a tour of the facility. Later, the group watched a 15-minute video presentation created by the Chemical School Historian covering the unit's role in serving our nation.

A veteran examines the life-size diorama created by the museum staff to illustrate the history of the battalion.

The Chemical Museum also hosted interview sessions between Waynesville High School history students and the veterans. The students queried the veterans on their wartime experiences, recording the information for posterity and inclusion in the Veterans History Project, a Library of Congress project that collects and preserves the extraordinary wartime stories of ordinary people.

Waynesville history students interview veterans for inclusion in the Veterans History Project.

Throughout the day, the veterans and their families were assisted by soldiers, staff, and volunteers from the Chemical School, the Noncommissioned Officer Academy, and the Chemical Corps Regimental Association. These

groups worked together to ensure that the veterans' visit to Fort Leonard Wood was safe, enjoyable, and memorable. That evening, at their annual dinner, the veterans discussed the reunion events. One man, an attendee of every reunion since 1946, announced that this year's reunion was the best ever. All were impressed by the honors paid to them, as a group and as individuals.

A direct descendant of the 1st Gas and Flame Regiment (World War I), the 2d Chemical Mortar Battalion was organized in 1935 to serve as the nation's primary gas warfare unit. During World War II, the battalion fought in North Africa, Italy, France, and Germany, making two amphibious landings and one glider assault. The 2d was the only chemical mortar battalion to fight in Korea; and when the battalion was redesignated as infantry in 1953, it marked the end of the Chemical Corps' association with the 4.2-inch chemical mortar.

Mr. Lindberg is the curator of collections at the US Army Chemical Corps Museum.

Tribute to the Men of the 2d Chemical Mortar Battalion

The following is an excerpt from a retreat ceremony honoring the memory of the men of the 2d Chemical Mortar Battalion. William R. Thomas delivered this speech on 15 September 2000 at Edgewood Arsenal (EA-APG), Maryland.

This historic Army post, once known as Army Chemical Center and as Edgewood Arsenal, was the last home of the Chemical Corps' oldest and most distinguished combat unit—the 2d Chemical Mortar Battalion.

We have assembled here today to observe a significant event in the history of our battalion and a memorable milestone for those of us who soldiered here fifty years ago. Exactly fifty years ago today, on September 15th in the year 1950, we boarded the troop train that would take us across the country to the ship that would take us to Korea. We left Edgewood to do what soldiers are supposed to do: fight wars to destroy the enemy and, in so doing, risk being destroyed.

Our departure marked the end of a year and a half of training, which began here with the reactivation of the 2d Chemical Mortar Battalion early in 1949. Because of our distinctive crest and patch, and perhaps because of our behavior, some called us the "Red Dragons." Our battalion commander was an old soldier who had fought in World War I and World War II. Many of our officers and NCOs had returned from the battlefields of World War II, which had ended only four years earlier. Like the Americans described in Tom Brokaw's best-selling book, they were indeed "the greatest generation." The rest of us had joined the Army recently, but shared a common belief that the purpose of the Army was to fight and win wars, not to serve as a social laboratory for special interests or militant feminists. Most of our men had volunteered. Their serial numbers began with the letters RA—Regular Army. We were a Regular Army unit. We were a combat unit and proud of it!

Here at Edgewood, we trained hard and played hard. There were constant training cycles. We learned to fire mortars. We learned to use our individual weapons. We learned to live in the field. Inspections and parades were a way of life. We joined the rest of the Army in large maneuvers. We trained Reserve and National Guard units. However, none of us really believed we would be in a real war.

By today's standards, life in the Army of 1950 was tough. In fact, it was designed solely to build disciplined soldiers to fill the ranks of an Army that would prevail on the battlefield. At times, the NCOs were abrasive. At times, the officers were arrogant. We belonged to an austere Army managed largely by combat veterans who discouraged interference by social engineers. The few dollars disbursed to privates at the pay table were often gone before the end of the month. The barracks, like those of World War II, would seem primitive to the soldiers in today's Army. A soldier leaving the post on weekends needed a Class A pass, which officers and NCOs often denied as a disciplinary tool.

Back then, some of our Red Dragons played hard—at times too hard. To paraphrase the title of a recent book: *We Were Soldiers Once…and Young*—and wild. From time to time, wayward Dragons, who were not reluctant Dragons, frequented most of the bars between here and Baltimore. They came as ambassadors of goodwill with the best intentions, but there were rumors that they drank too much, picked fights with peace-loving civilians, and chased wild women. Some of these escapades led to AWOLs, company punishment, and court-martials. The battalion also had more than its share of discharges under the so-called Section 8.

All of the challenging activities I have described preceded the 2d Chemical Mortar Battalion's departure from Edgewood on September 15, 1950. According to the battalion command report, our actual strength was then 35 officers and 450 enlisted men, slightly less than two-thirds of our authorized strength. This was typical of the Army of 1950 which, like today's Army, was the victim of questionable political decisions that seriously compromised our nation's military strength. As we left Edgewood, it appeared that the retreating American and South Korean forces had halted North Korea's unexpected invasion of South Korea and had regained the initiative. Those of us who mistakenly yearned to be in a real war feared that it would end before we got there. Unfortunately, we got there in time.

Our ship arrived in Pusan on October 8, 1950. By then, most of the North Korean Army had retreated across the 38th Parallel back into North Korea. On October 22, we caught up with the front, which was then north of Pyongyang (North Korea's capital). There, we were placed in support of the 1st Republic of Korea Infantry Division—called the 1st ROK Division—and fired our first mission the next day.

To make a very long story short, the war did not end as it should have. Within days of our arrival at the front, the Chinese Communist forces intervened with their numerically superior army, which soon numbered over 300,000 men. Their initial devastating attack was focused on the 1st ROK Division (which our battalion then supported) and the adjacent US 1st Cavalry Division, both of which were deployed north of the village of Unsan, about 40 miles from the Chinese border. As the regiments we supported were overwhelmed and routed, our battalion experienced heavy losses in the Unsan engagement. These losses increased as we engaged in intense combat throughout the month of November 1950.

During much of this period, we supported the US 2d Infantry Division in a series of offensive and defensive engagements with the Chinese army, culminating in the critical and costly Battle of Kunuri. At that time, Walter Winchell, a widely followed commentator and columnist said of the 2d Infantry Division: "If you have a son overseas, write to him. If you have a son in the 2d Division, pray for him." This applied as well to the 2d Chemical Mortar Battalion.

By the end of November, the battalion command reports showed a total strength of only 25 officers and 314 enlisted men—30 percent less than the number who boarded the train at Edgewood and less than half of the authorized strength. This significant attrition resulted mainly from battle casualties (including those killed, wounded, or captured) and a limited number of nonbattle casualties. More than half of the brave men whose names appear on the bronze plaque to be dedicated today were lost by the end of November 1950.

The tremendous firepower of our 36 mortars took a heavy toll on the enemy, but the brave men of our battalion also paid a heavy price, measured by our growing roster of casualties.

For the next two months, pursued by the Chinese army in bone-chilling, subzero weather, we participated in the longest retreat in the American Army's history. In January 1951, the dwindling ranks of the original Red Dragons who left Edgewood were reinforced by urgently needed replacements, totaling 7 officers and 140 enlisted men. The last major Chinese attack was contained in April 1951, and the tides of battle turned in favor of the American Army. The UN Commander in Chief, General Matthew Ridgeway, later said, "If we had been ordered to fight our way to the Yalu, we could have done it." However, the political leaders of the United States and the United Nations were unwilling to pay the price of absolute victory. Instead, they opted for fruitless truce talks, which began in July 1951, while a costly limited-objective war raged for two more years.

Throughout these trying two years, our battalion remained in the fight, supporting a growing list of United States and United Nations infantry divisions. The tremendous firepower of our 36 mortars took a heavy toll on the enemy, but the brave men of our battalion also paid a heavy price, measured by our growing roster of casualties. Finally, an armistice agreement was signed on July 27, 1953, and Korea remained a divided nation.

Hundreds of replacements replenished the ranks of the 2d Chemical Mortar Battalion during its nearly three years of combat in Korea. For the last six months of the war, it was renamed the 461st Infantry Battalion (Heavy Mortar). Those soldiers who served in our battalion at any time, under either name, have collaborated in writing the many chapters of its distinguished history.

The real heroes of our battalion are not here today. They made the supreme sacrifice nearly 50 years ago. Their young lives ended prematurely on the Korean battlefields and in prison camps. They are gone, but not forgotten. We gather here today to salute them and, immediately after this retreat parade, to dedicate a bronze plaque which records their 61 names so that future generations may pay tribute to them. Because of their sacrifice, we and others will know that *Freedom Is Not Free*.

This tribute was originally published in the October 2000 issue of Red Dragon, the newsletter of the 2d Chemical Mortar Battalion Association.

Submitting an Article to *Army Chemical Review*

Articles may range from 2,000 to 4,000 words. Send a paper copy along with an electronic copy in Microsoft Word on a 3 1/2-inch or compact disk to *Army Chemical Review*, 401 MANSCEN Loop, Suite 1029, Fort Leonard Word, Missouri 65473-8926 or e-mail <*acr@wood.army.mil*> with "Submit an Article" in the subject line.

Contributors are encouraged to include black-and-white or color photographs, artwork, and/or line diagrams that illustrate information in the article. Include captions for any photographs submitted. If possible, include photographs of soldiers performing their missions. Hard-copy photographs are preferred, but we will accept digital images in TIF or JPG format originally saved at a resolution no lower than 200 dpi. Please do not include them in the text. If you use PowerPoint, save each illustration as a separate file and avoid excessive use of color and shading in graphics and slides. Please do not send photographs embedded in PowerPoint or Microsoft Word documents.

Articles should come from contributors with firsthand experience of the subject being presented. Articles should be concise, straightforward, and in the active voice. Any article containing information or quotations not referenced in the text should carry appropriate endnotes.

Include your full name, rank, current unit, and job title. Also include a list of your past assignments, experience, and education and your mailing address, fax number, and commercial daytime telephone number.

Include a statement from your local security office stating that the information contained in the article is unclassified, nonsensitive, and releasable to the public.

All submissions are subject to editing.

New Program Criteria

On 2 February 2005, the Chemical Corps Regimental Association (CCRA) Board of Governors approved a new Order of the Dragon Program (OODP). The OODP was established to maintain and enhance the legacy of the Chemical Corps and to promote cohesiveness and esprit de corps in the Chemical Corps Regiment by recognizing individuals who have served the Corps with distinction. The new OODP consists of three awards: the Ancient Order, the Honorable Order, and the Carol Ann Watson Spouse Award. Nominated personnel must meet the criteria established for each level of recognition.

Ancient Order of the Dragon nominees must—

- Be a current member of the CCRA. Special consideration will be given to lifetime membership in the CCRA.
- Have contributed conspicuous, long-term service to the Chemical Corps and the CCRA throughout a distinguished career. Special consideration will be given to service continuing after retirement.
- Have completed twenty-plus years of service to the Chemical Corps and the CCRA.
- Be honorably retired as a lieutenant colonel, sergeant first class, GS-12, or higher rank or grade.
- Have maintained the highest standards of personal conduct throughout their career.
- Be or have been a member of the Chemical Corps in an Active Army, Army National Guard, or Army Reserve status for the majority of their career.
- Be or have been a member of the US armed forces or the Department of Defense who provided continuing service to the Chemical Corps and/or chemical, biological, radiological, and nuclear (CBRN) readiness for the majority of their career.

Nomination for the Ancient Order of the Dragon must be made by a Chemical Corps lieutenant colonel or higher rank or an officer of the CCRA. Ancient Order of the Dragon status must be approved by the Chief of Chemical, as recommended by an annual selection board.

Honorable Order of the Dragon nominees must—

- Be a current member of the CCRA.
- Possess qualities that set them apart from other Chemical Corps personnel or their peers.
- Have completed a minimum of five years of service to the Chemical Corps and successfully completed the Advanced Noncommissioned Officers Course or the Captains Career Course. Consideration will be given to similar education for sister service and foreign military members.
- Be eligible for favorable military actions (military members only) and be of good character.
- Have maintained the highest standards of personal conduct (both on and off duty).
- Be a Chemical Corps officer or noncommissioned officer in an Active Army, Army National Guard, or Army Reserve status or a Department of the Army civilian who has supported the Chemical Corps.
- Be or have been a member of the US armed forces or the Department of Defense who provided service to the Chemical Corps and/or CBRN readiness.
- Be a foreign military member or civilian who has contributed to furthering the mission of the Chemical Corps.

Nomination for the Honorable Order of the Dragon must be made by a member of the CCRA. Honorable Order of the Dragon status must be approved by the first Chemical Corps colonel in the chain of command or responsibility. If there is no Chemical Corps colonel, the Assistant Commandant of the US Army Chemical School will be the approving authority. Approval authority for the Honorable Order of the Dragon will not be delegated below the rank of colonel.

Carol Ann Watson Spouse Award nominees must—

- Be a spouse who has voluntarily provided significant contributions and support to the Chemical Corps, a chemical unit, chemical families, or a community.
- Possess qualities that set them apart from other Chemical Corps spouses or their peers.
- Be the spouse of a Chemical Corps soldier or civilian associated with service to the Corps and/or CBRN readiness.

Nomination for the Carol Ann Watson Spouse Award must be made by a member of the CCRA. The Spouse Award will be approved by the first Chemical Corps colonel in the chain of command or responsibility. If there is no Chemical Corps colonel, the Assistant Commandant of the US Army Chemical School will be the approving authority. Approval authority for the Spouse Award will not be delegated below the rank of colonel.

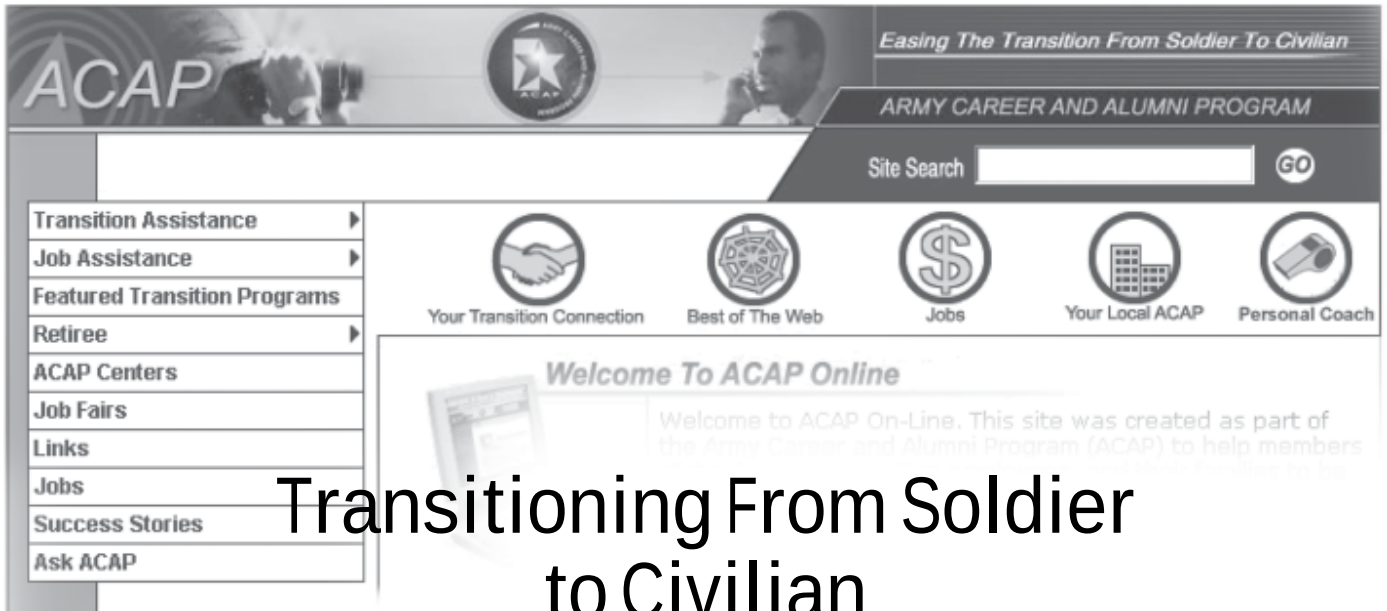
Information concerning the new OODP will be available soon on the CCRA Web site <*http://www.chemical-corps.org*>.

2004 Inductees

Name	Award
Captain Lawrence R. Allison	Order of the Dragon
Mr. Lee Anderson	Honorary Order of the Dragon
Major Mark T. Anderson (Retired)	Order of the Dragon
Sergeant First Class Jeffrey D. Armbruster	Order of the Dragon
Lieutenant Colonel Michael D. Avery	Order of the Dragon
Mr. Andrew Z. Baker	Order of the Dragon
Mr. Robert E. Baker	Order of the Dragon
Master Sergeant Melven G. Banner (Retired)	Order of the Dragon
First Sergeant Matthew D. Barnes	Order of the Dragon
First Sergeant Merika L. Barnes	Order of the Dragon
Colonel Michael W. Bechtold	Order of the Dragon
Sergeant First Class Hazel L. Bergstrom	Order of the Dragon
Master Sergeant Scott J. Boatman	Order of the Dragon
Captain W. Maria Bochat	Order of the Dragon
Mr. Larry Bocknek	Honorary Order of the Dragon
Sergeant First Class Barbara B. Borja	Order of the Dragon
Sergeant First Class Marvin T. Branch	Order of the Dragon
Sergeant First Class Antonio L. Brown	Order of the Dragon
Mr. Douglas W. Bryce	Honorary Order of the Dragon
Colonel Russell A. Bucy	Order of the Dragon
Mr. Donald Buley	Order of the Dragon
First Sergeant Michael A. Burk	Order of the Dragon
Colonel Neal Burnette	Honorary Order of the Dragon
Command Sergeant Major John M. Burns	Order of the Dragon
Sergeant First Class Charles Carr	Order of the Dragon
Colonel Leslie Johnson Carroll	Order of the Dragon
Lieutenant Colonel Lary E. Chinowsky	Order of the Dragon
First Sergeant Michael T. Clark	Order of the Dragon
Sergeant First Class Troy Coleman	Order of the Dragon
Sergeant First Class Ralph Lee Coler	Order of the Dragon
Captain Francisco D. Constantino, Jr.	Order of the Dragon
Dr. Jo Jo Corkan	Honorary Order of the Dragon
Colonel Bob Coughlin (Retired)	Order of the Dragon
Colonel Frank Cox (Retired)	Order of the Dragon
Major Kelly A. Crigger	Order of the Dragon
Lieutenant Colonel James Harold Crout, Jr.	Order of the Dragon
Commander Charles H. Cutshall	Honorary Order of the Dragon
Colonel Robert J. Dalessandro	Order of the Dragon
Sergeant Major Lonnie E. Darden	Order of the Dragon
Sergeant First Class Charles E. Dashiell	Order of the Dragon
Colonel Henry J. Davis	Order of the Dragon
Sergeant Major Robert F. Davis	Order of the Dragon
Sergeant First Class Christopher J. Dewhirst	Order of the Dragon
Captain John Kennedy Edwards	Order of the Dragon
Colonel Gary Eifried (Retired)	Order of the Dragon
Master Sergeant John W. Eley	Order of the Dragon
Mr. Stanley Enatsky	Honorary Order of the Dragon
Mr. Roderick Scott Farrar	Order of the Dragon
Lieutenant Colonel Joseph R. Feliciano	Order of the Dragon
Sergeant First Class Harry W. Feyer	Order of the Dragon
First Sergeant Melvin J. Fields	Order of the Dragon
Sergeant First Class Jeffrey P. Garcia	Order of the Dragon
Mr. Dale I. Gechter	Order of the Dragon
Captain Randy D. George	Order of the Dragon
Sergeant First Class Stephanie M. Gibson	Order of the Dragon
Sergeant First Class David G. Glynn	Order of the Dragon

2004 Inductees

Name	Award
First Sergeant Herbert Gould	Order of the Dragon
Captain Christopher A. Grice	Order of the Dragon
Chief Warrant Officer 5 Larry Grisham	Honorary Order of the Dragon
First Sergeant W. Roger Gunter	Order of the Dragon
Master Sergeant Manuel Gutierrez, Jr.	Order of the Dragon
Captain Charles M. Gutowski	Order of the Dragon
Major George Heib (Retired)	Order of the Dragon
Sergeant First Class Ronald R. Hilaire	Order of the Dragon
Captain William David Hoyt	Order of the Dragon
Ms. Lauren M. Ishmael	Honorary Order of the Dragon
Lieutenant Colonel Raymond Edward Johnson	Order of the Dragon
Sergeant First Class Romerio D. Johnson	Order of the Dragon
Mr. William L. Jordan	Honorary Order of the Dragon
Specialist Forest J. Jostes	Order of the Dragon
Specialist Mark J. Kasecky	Order of the Dragon
Staff Sergeant Mark D. Kennon	Order of the Dragon
Lieutenant Colonel Patrick Kidd	Honorary Order of the Dragon
Colonel Steve E. Lawrence	Order of the Dragon
Mr. Clinton R. Longenecker, Jr.	Order of the Dragon
Command Sergeant Major Ted A. Lopez	Order of the Dragon
Sergeant First Class Richard Magnanti	Order of the Dragon
Mr. Alexander R. Margin, Jr.	Order of the Dragon
Mr. John Martino	Order of the Dragon
Sergeant First Class David W. Moragne	Order of the Dragon
First Sergeant Leroy G. Mundy	Order of the Dragon
Ms. Elaine K. Neary	Honorary Order of the Dragon
Colonel Douglas J. Norton	Order of the Dragon
Sergeant First Class Charles L. Nuce	Order of the Dragon
Mr. Vernon L. Ollar	Order of the Dragon
Command Sergeant Major Roger L. Parker, Jr.	Order of the Dragon
Mr. Donald O. Pike	Order of the Dragon
Sergeant First Class Jesse Potter	Order of the Dragon
First Sergeant George A. Richards	Order of the Dragon
Major Robert W. Ryan	Order of the Dragon
Sergeant First Class Arturo E. Salcedo	Order of the Dragon
Sergeant First Class Rodney Dewayne Shelby	Order of the Dragon
Captain Michael Shawn Sims	Order of the Dragon
Lieutenant Colonel Pratya Siriwat	Order of the Dragon
Lieutenant Colonel (P) Leslie C. Smith	Order of the Dragon
Colonel Steven Wade Smith	Order of the Dragon
Sergeant First Class Robert Stallion (Retired)	Honorary Order of the Dragon
Lieutenant Colonel William T. Steele	Order of the Dragon
Captain Jennifer Lynn Striegel	Order of the Dragon
Lieutenant Colonel Kim Chan Sup	Order of the Dragon
Sergeant First Class John Tellez (Retired)	Order of the Dragon
First Sergeant Sarita Y. Thomas	Order of the Dragon
Lieutenant Colonel Phillip M. Trued	Order of the Dragon
Colonel Lewis L. Vandyke	Order of the Dragon
Dr. John V. Wade	Order of the Dragon
Sergeant Gregory L. Wahl	Order of the Dragon
Mr. Donald F. Whislter, Jr.	Order of the Dragon
Colonel Lewis Manning Whisonant	Order of the Dragon
Sergeant First Class Gregory A. White	Order of the Dragon
Master Sergeant Bobby C. Williams	Order of the Dragon
First Sergeant Keith Ray Wilson	Order of the Dragon
Sergeant First Class Clay R. Young	Order of the Dragon



Transitioning From Soldier to Civilian

Leaving the federal service? Let the Army Career and Alumni Program (ACAP) ease the way. ACAP was created to help soldiers, Department of the Army civilians, and family members transition from federal service to civilian life. Army National Guard and US Army Reserve members who have completed 180 or more days of Active Army service are also eligible for ACAP services.

ACAP counselors help users establish individual transition plans (ITPs) that encompass education, training, and employment goals. ITPs help personnel identify actions and activities associated with the transition process and then organizes them into manageable tasks. Assistance is available in the following areas:

- ✓ Setting realistic objectives.
- ✓ Assessing abilities.
- ✓ Exploring the job market.
- ✓ Creating effective resumes.
- ✓ Applying for federal jobs.
- ✓ Performing your best at job interviews.
- ✓ Dressing for success.
- ✓ Evaluating and negotiating job offers.

ACAP provides two ways for users to search job opportunities online: ACAP job listings and a "spider" search. ACAP job listings represent opportunities posted by employers who are interested in hiring soldiers because of the personal traits and professional skills they possess. The spider search connects users with job opportunities through a search of what ACAP considers some of the best Web resources.

Eligible users can seek one-on-one help at their nearest ACAP center. Those who don't live near an ACAP center can obtain assistance online at <*www.acap.army.mil*>.

This article is a reprint from a similar article that appeared in the September 2004 issue of Soldiers magazine.

The New Army Safety Campaign Plan

By Mr. Fred Fanning

"Our soldiers are too valuable to the Army and their families to take any chances with their safety. Each life saved, each serious injury avoided, and each piece of equipment undamaged may be the deciding factor in a battle on the Global War on Terrorism."

—Honorable Les Brownlee
Acting Secretary of the Army

The Acting Secretary of the Army has implemented a new campaign to reduce and eliminate the accidental deaths of soldiers, civilian employees, and family members. This new campaign provides support for the ongoing war effort and places a new focus on personal safety. The new "Our Army at War, Be Safe, Make it Home" campaign targets motor vehicle accidents, focusing on the use of seat belts and child safety seats and the dangers of drinking and driving.

According to an April 2004 letter from the Secretary reference the Army Safety Campaign Plan, 26 percent of the casualties in Iraq are not combat-related. The letter went on to state that in the past 23 years, the Army has lost 7,500 soldiers to accidents, as compared to the 600 lives lost in combat. The accident total for 2003 was the highest in 10 years—more than 55 percent of the deaths were caused by preventable motor vehicle accidents. The campaign was designed with a goal to reduce preventable accidents by 50 percent by the end of Fiscal Year 2005 through the use of programs designed to educate Army personnel in the hazards associated with motor vehicle accidents and the control measures required to prevent them. All Army personnel are required to watch the new Be Safe video. If you have not seen the video, check with your installation safety office or unit safety personnel or view it on the US Army Safety Center Web site at <*http://safety.army.mil*>. The video highlights safety spots from NASCAR drivers and musical artists.

The new banners and posters displayed at Army installations are reminders to follow the rules of the road, use seat belts, place children in safety seats, and avoid drinking and driving. Additionally, new bumper stickers can be seen sporting the *Be Safe* slogan. In addition to the new awareness materials, emphasis has been placed on the Commander's Safety Course (Army Distance Learning Program) available at <*https://www.aimsrdl.atsc.army.mil/secured/accp_top.htm*>. This course (No. 012 G1402) is a requirement for commanders, first sergeants, and collateral-duty safety officers and noncommissioned officers.

In the future, the Army will also be placing additional emphasis on risk management training. This training is designed to supplement the integration of risk management in all Army operations. To aid Army personnel in learning what causes accidents and how those accidents can be prevented, the Army has launched a new risk management tool called the *Army Safety Management Information System* or *ASMIS-1*. To use this new tool, go to the US Army Safety Center Web site, select the

ASMIS-1 option, and log on using your Army Knowledge Online (AKO) user name and password (or follow the instructions for non-AKO users). This tool can be used to perform a risk assessment before making a trip.

The new Army Safety Campaign is part of the road to safety success. Please join us in saving lives!

Mr. Fanning is the Senior Safety Manager at the Army Safety Office.

The 68th Chemical Company Provides Shoes for Needy Iraqi Children

By Sergeant Santiago Rubio

The 68th Chemical Company would have been content to collect several hundred pairs of shoes for needy Iraqi children. Instead, the unit received donations of more than 5,000 pairs of flip-flops, sandals, and sneakers from people in the United States. And the boxes kept coming!

Iraqi children in the Al Rashid district of Baghdad pose with a soldier from the 68th.

The 68th Chemical Company, 1st Cavalry Division, is currently serving in the Al Rashid district of southern Baghdad. The unit initially began the shoe drive when they saw that many Iraqi children had no shoes on their feet. Publicity from the event widened when the Catholic News Service picked up the story. Shoe shipments (and a few monetary donations) from all over the United States began to pour into the unit. The company distributed 1,000 pairs of shoes at the first distribution. According to the executive officer of the 68th, there were so many boxes arriving at the unit, soldiers began distributing the shoes during patrol missions.

This simple, but significant, act of charity has created a bright spot for the 68th Chemical Company during the difficult time of deployment. Even with the hardships that our troops face in Iraq, the faces of the grateful children proved that most of the Iraqi people are appreciative of the peace efforts in their country.

Iraqi children crowd around soldiers delivering free footwear.

This article was submitted by the US Central Command Public Affairs Office.

By Fred Fanning

Are you willing to help save the life of a soldier returning from war? If so, Uncle Sam wants you to become a Guardian Angel. Soldiers returning from war are at high risk of being involved in accidents unless someone steps in to help stop them. Operation Guardian Angel is a new program designed to provide that help.

During a war, Army buddies watch over each other. Soldiers get used to this buddy system and depend on it. The buddy system provides a safety net for soldiers. However, when a soldier returns home or goes on leave, his buddy isn't there. Soldiers returning home need family and friends to watch over and assist them through this often difficult readjustment period. In a sense, the family members become the buddies. But life for the returning soldier can be very different from when they left. These soldiers go back to driving cars or motorcycles and begin reestablishing relationships with family and friends. Some soldiers may choose to overindulge in alcohol, while others may become distraught due to difficulty with relationships.

Operation Guardian Angel is a national campaign that encourages families, friends, neighborhoods, and communities to remind soldiers to practice safety procedures. The objective of the campaign is to protect soldiers from injuries and accidents. Guardian Angels talk to soldiers and remind them about such things as—

- Wearing seat belts.
- Avoiding drinking and driving (or calling a cab if they have been drinking).
- Planning for extra time during long trips or hazardous driving conditions.
- Using safety gear and practicing safety procedures.
- Taking along a buddy when hiking or swimming.

Guardian Angels help get the message out and recruit additional Guardian Angels in their community by contacting local radio and television stations to make public service announcements and asking groups such as the Veterans of Foreign Wars (VFW), American Legion, American Veterans (AMVETS), and local school and community organizations to implement the program.

Support groups at the unit level are encouraged. Unit leaders can participate by identifying soldiers scheduled for leave and contacting the soldier's family to inform them about the Guardian Angels. Family members can go to <*http://safety.army.mil*> to learn more about Operation Guardian Angel. The Web site also contains a printable certificate to display in a home or an automobile window.

Operation Guardian Angel is a national campaign that encourages families, friends, neighborhoods, and communities to remind soldiers to practice safety procedures.

Local establishments can support the program by registering on the Web site and printing a Guardian Angel certificate to display in their businesses. If a business serves alcohol, it can implement a designated driver or taxi program.

You can make a difference in the life of a soldier. Anyone who cares enough to help a soldier stay safe once they return home can participate in the program. Take the first step by becoming a Guardian Angel!

Mr. Fanning is the Senior Safety Manager at the Army Safety Office.

Book Reviews

By Mr. Reid Kirby

Lab 257: The Disturbing Story of the Government's Secret Plum Island Germ Laboratory, Michael Carroll, William Morrow, 2004.

Lab 257 is Michael Carroll's first book. The author spent more than seven years researching Plum Island's history and interviewing recent island employees and residents in the nearby community. By federal law, researchers are not allowed to investigate animal diseases of economic importance within the conterminous United States. After World War II, the US Department of Agricultural and the US Army Chemical Corps needed a location to investigate animal diseases with biological warfare (BW) potential. Plum Island, a couple of miles offshore of Long Island, New York, served as a location where such research could be conducted without presenting hazardous conditions for US livestock.

Mr. Carroll takes what could be an interesting history about a fascinating research establishment and turns it into a sensational exposé. The title, *Lab 257*, is undoubtedly intended to stir the imagination into a comparison with Japanese Unit 731 and offers an aborted attempt that the would-be founding father of the establishment was a German BW scientist. I was originally interested in this title with the hope that there would be something revealed about the little-understood BW program by Germany during World War II. The author tries to make the case that the German scientist is a war criminal, not through any involvement in human experiments, but rather through association with the Nazi Party and the specter of antianimal BW work. Additionally, Mr. Carroll tries to make a case that Lyme disease originated at Plum Island and conjectures several means by which animal diseases could have left the island. The position is as incredible as it is strange. The author changes the mood throughout the book, taking a harsh tone with past scientists, while warming to those still living that could be interviewed. There is even a short dramatization of a biological mishap. *Lab 257* would be cautiously valuable to someone writing a history of Plum Island, but is otherwise an example of fringe literature with a portrayal of almost every form of novelist style. The author has unfortunately wasted an opportunity to write a credible history.

Greek Fire, Poison Arrows & Scorpion Bombs: Biological and Chemical Warfare in the Ancient World, Adrienne Mayor, Overlook Press, 2003.

It is always a welcome sight to see a unique, professional perspective on the history of chemical-biological (CB) warfare. Adrienne Mayor is a folklorist by profession, and her writing demonstrates just how commonplace CB warfare was in the ancient world.

Contemporary scholars often ignore the significance of CB warfare in history. Works on World War I generally limit chemical warfare to a paragraph or so on the battles of Ypres or the use of mustard gas but fail to note how almost every artillery barrage involved the use of poisonous gas in some form. A general observation is that only the most notorious CB events remain in history, typifying what was more or less commonplace at the time.

Ms. Mayor's husband is noted as a historian on ancient military history, and throughout the book text there is an argument of *jus in bello* scratching under the surface. Bringing mythology, classical literature, and ancient history together creates a story replete with instances of enemies using CB warfare in its crudest and earliest forms. Peppered throughout the text are examples to draw parallels with the modern-day concept of CB warfare.

Greek Fire, Poison Arrows & Scorpion Bombs is an invaluable text for the chemical soldier to better understand CB warfare from its classical roots. It provides vivid stories that make presentations interesting and historical examples that can typify points true today. Throughout the stories is the moral that while CB warfare is a potent weapon, it brings tragedy to the user and the victim alike.

Mr. Kirby is a project manager for TALX Corporation. He holds a bachelor's degree in valuation science from Lindenwood College, with a minor in biology and special studies in behavioral toxicology and biotechnology.

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